FOOD MANUFACTURE

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FOOD MANUFACTURE

Vol. XXIII, No. 3 March 1, 1948

The Pig Meat Target

THE Government's plan to treble the output of pig meat by 1951-1952 is believed by many agricultural authorities to be threatened by the unsatisfactory position of world supplies of feedingstuffs. It has been announced that harvests of these crops during 1947 have been poor. The Ministry of Food has been in negotiation with 16 countries, including hard currency areas, on the matter. In a number of instances these negotiations are still proceeding.

Pig production is dependent on feedingstuffs rather than on the price payable for fat pigs, and the recent increase in the guaranteed price of pigs is expected to have only a limited effect in increasing production unless larger supplies of feedingstuffs are forthcoming. Representations have been made to the Ministry of Agriculture showing the quantities of feedingstuffs that will be required if the pig production target is to be reached.

Increased home production of bacon is essential if the present meagre ration is to be raised without adding to the nation's economic troubles, but this year's output has been very disappointing, due to the decline in the pig population. On June 4, 1946, Britain had 1,952,000 pigs, but on June 4, 1947, the total was only 1,629,000—a smaller total than at any time during the war.

Production of bacon and ham has been much lower every month during 1947 than in the corresponding months of 1946. In September the output averaged only 900 tons a week and in no month did it exceed 1,500 tons. The weekly average in 1946 was 2,080 tons and in 1945 it was 2,280 tons.

Every decline in production increases its cost. Only by attaining maximum output can bacon be manufactured at the lowest price. If the Government target for 1951-52 be reached the output of bacon and ham will be only about 4,200 tons a week, which is not much higher than the average of 3,700 tons achieved under war conditions in 1940.

Feedingstuffs are at present allocated to farms on which pigs were kept in 1939. A scheme has been submitted to the Ministry of Agriculture for making allocations available to other farmers, but the official view is that, as the scheme would necessitate reducing the pig rations to those farmers who now receive them, the national position would not be improved.

In spite of the Russian trading agreement, under which Britain hopes to receive 750,000 metric tons of feeding grains by September next, Mr. Tom Williams is not yet able to announce any increase in allocations for pig feeding. The most that he has been able to do is to express the hope that the rations will be maintained "at least" at the present level until March, 1949.

Bakers Question Minister of Food

The Minister of Food was put through the hoop by delegates to the Bakers' National Association Council meeting recently. One delegate asked why we could buy such things as a toy tank and *brassières* from New York when we were so much in need of foodstuffs. The Minister, pointing out that these were token imports, said that even if they were entirely cut down it would not make a great difference in the wheat bill, the cotton bill and other big bills we have to meet.

Another delegate asked if more sugar could be made available in the next three or four months, the reply being that sugar was available but at the moment dollars were not. On the possibility of importing dried egg whites and dried yolks, which the industry could mix or use separately, and also shelled almonds, coconuts and walnuts, again the answer was dollars. However, the question of developing Australia as a source of processed eggs on a very large scale was being examined. With regard to nuts, there was no shipping problem, but it was a question of price.

The flour extraction rate was mentioned, and it was suggested that it should be reduced from 85 per cent. to 80 per cent., so that more cattle could be fed. Apparently the Minister shelved this question, being reported to have said that 150,000 tons of feedingstuffs had been bought from Russia, but we had to send steel rails, machinery and every kind of export, short-supply goods to pay for those feedingstuffs. If and when

we could produce more of these goods Russia would send more feedingstuffs to us. The miners, steel workers, and engineering workers were the only people who could make it possible to buy feedingstuffs, and their efforts controlled the volume of these commodities which could be bought.

To a suggestion that ½d. should be put on to the price of a large loaf, the Minister said it would be a serious matter to increase the price of any food, and if we did this less subsidy would have to be paid. It had had to be done in some cases, but he could not anticipate what was fundamentally a Budgetary matter. He could not speculate on the possible level of food prices under the Chancellor's ruling that food subsidies must not increase. He emphatically denied that there was any intention of removing the bread subsidy.

The matter of the exportation of thousands of tons of slab cake every week from this country and the rumour of the importation of confectioners' cake were raised. The answer to this was that we were exporting various high value foodstuffs, in which no doubt some cake was involved, to dollar destinations, and importing a little manufactured cake from Australia, but it was necessary to continue to use ingredients and to export to dollar areas what might be called luxury exports. It always paid to export luxuries and import necessities. That type of food export of high quality, chocolates or cake, gained dollars with which we could buy feedingstuffs in far greater quantities. It was sound business however difficult it was to explain to people who say: "Good Lord, exporting food, that sounds mad."

"As Old as You Feed?"

On Biblical authority we may expect about three score years and ten barring "incidents" or accidents; insurance companies, studying the problem with decimal-pointed realism, can provide whole ranges of life expectation according to sex, occupation, chance, habits, heredity, and the rest. Bernard Shaw in the diversity of his philosophy has paid particular attention to this question of longevity, and whatever we may think about Shavian unorthodoxies Shaw as a biological fact remains with us displaying a personal example of great age associated with good physical health and almost undiminished mental vigour. But it is only recently that scientists have decided to tackle the problem of ageing and its effects, and Shaw may well chuckle in his nineties to see orthodoxy taking up the hints he has been throwing out for half a century. The science or study of age is now called gerontology, and a new American journal is devoted each quarter to gerontological research.

In this country *Discovery* has reported some of the early indications of the gerontologists. It seems that nutrition has a good deal to do with age and its attack upon human dynamics. The bees with their superb control over destiny have more than something to tell us. If the hatched grub is fed on royal jelly alone it becomes a queen bee with an average life of five years; if, however, it is taken off royal jelly after four days and then fed upon pollen and honey it becomes a worker bee with a life span of three months. Only one kind of egg leads to the queen bee or the worker, so that this enormous difference in life expectation depends upon diet. Royal jelly is less supplied with carbohydrate than pollen and honey; but it contains an abundance of nucleoprotein, the B group vitamins, and is said to be the richest source of pantothenic acid. Does this apply only to the bees? Dr. T. S. Gardener has fed royal jelly to fruit flies and increased their life. He has also fed nucleoprotein, two of the B group vitamins, and pantothenic acid separately and together to fruit flies. The combined diet increased life duration by 47 per cent.; the separate results were less remarkable, though pantothenic acid gave an increase of 27 per cent.

Dr. Gardener has also investigated the effects of feeding mice on nucleic acid, a 20,000th of an ounce being fed to each mouse daily. Male life was increased by 8·4 per cent. and female life by 7·4 per cent. Does the extra supply of nucleic acid, a fundamental part of all living cells, maintain a high content of nuclear material in cells for longer than is "normal," a property of youthful cells? Are cells kept in existence longer because there is more nucleic acid available? Or are certain cells stimulated so that resistance to infection is increased and one of the weaknesses of age thus delayed? These are all possible theories of the role of nucleic acid in advancing life's duration. Should this kind of research proceed at the usual pace of current science, the sociological and political consequences could be as great as those of atomic fission. It would seem that the young scientists in today's biochemical laboratories have a task that might well lead to the lengthening and ameliorating of their own retirements. Life insurance companies, seeking income investments for their accumulations of funds, might well divert money towards gerontological research out of sheer self-interest.

Detection of Storage Damage

In view of the serious position of supplies necessitating rationing of potatoes any test which serves to detect damage in stored seed or food stocks of this commodity will receive renewed attention. It may be of interest to recall the rapid fluorescence test of W. Newton and W. Jones (*Can. J. Research*, 1945, **23C**, 76) for the detection of frost damage or low temperature injury in potato tubers. They found that freshly cut sections of potato tubers (and, incidentally, of apple fruit tissue) exhibit fluorescence when examined under the ultra-violet lamp after being frozen at −10° for 24 hours, the effect persisting after thawing. Acetone extracts of the frozen and damaged tissue also show fluorescence in the same way as the corresponding tissues. Several other types of plant tissue were examined but none showed the fluorescent effect given by potato and apple sections. This test, used in conjunction with the portable ultra-violet light viewer which is easily folded to go into an overcoat pocket, offers possibilities of the rapid examination of potatoes in clamps to detect damage by frost after a "cold snap."

The "Super-Pig" Again

The matter of the "Super-pig," Minnesota No. 1, said to have been developed by Dr. Lawrence Winters of the University of Minnesota, seems to have been widely misunderstood, according to H. R. Davidson, writing in the *Farmer and Stock-Breeder* (February 3). The aim of the American workers (he states) was to break away entirely from the existing concept of "breeds" as the basis of commercial breeding policy and to see if an entirely new idea could not be put across. If it proved successful, this idea, *i.e.* that commercial production should be based on continual planned cross breeding between carefully bred and selected pure strains instead of on so-called "pure breds," would provide as revolutionary an idea as artificial insemination. But the idea has not yet proved successful, because it has not yet had time to be proved either successful or unsuccessful.

Mr. Davidson goes on to ask: "Why, then, are we given to believe that the production of the Minnesota No. 1 strain is to be regarded as the purposeful production of a new 'breed,' and that this new breed is so much better than any other breed? A 'breed' maintained and reproduced as a 'breed' by the exchange of male and female stock between commercial breeders with small herds and under no, or little, scientific control can never, from a genetic point of view, be 'pure,' and so no guarantee can be given that records of production obtained from sample pens can be repeated."

Two things surprise Mr. Davidson. One is that so many observers from this country, sufficiently experienced to justify the travelling expenses involved, have failed to understand and report on the significance of the American work. The other is that the American workers have allowed themselves to be quoted as saying that they have in fact produced a new breed; that it is a superbreed; and that more breeds can be produced in a few years, while saying nothing about the progress of the investigation into replacing "breeds" by a system of combined in-breeding and planned crossing.

Saltiness in Food Products

The problem of the degree of saltiness in a food product is one that constantly engages the attention of those concerned with quality control. The remarkable variation in the verdicts as to the intensity of salty flavour pronounced by members of the same panel is a common occurrence, while the opinion of members of the public will be more divergent still.

In determining the correct amount of salt to a food product, it should be varied by small increments in a series of batches until the product begins to exhibit a salty flavour. Once this upper limit has been determined, the amount should be reduced to the point where the saltiness is no longer apparent. This is the advice of J. A. Dunn in a paper read before the sixth annual food conference in Buffalo. He mentions that it is well known that other flavours are developed by salt, probably due to the fact that our sense of taste is more keen in its presence. Thus, the amount of fresh orange juice and rind in an orange icing may be reduced if a small amount of salt is included in the formula. This is an important point when the cost of flavouring ingredients is compared with that of salt.

The purity of salt is an important factor. Although it is commonly recognised that pectin reacts towards the alkaline earths and sodium as a zeolite base exchanger, used for water softening, it is not so generally recognised that proteins and starches react similarly. It is well to think of pectins, proteins, and starches as base exchangers. It is a relatively simple matter to remove alkaline earths by replacing these ions with sodium through the use of soft water and pure salt, by which means some of the physical properties of food products may be modified. For instance, it

has been shown that when fish products and vegetables are processed and the canned samples held in storage the sodium enters the solid portion, whereas the calcium and magnesium are dialysed out and increase the processing brine.

Some such explanation may account for the diminution of salty flavour of canned meat products. Immediately after manufacture samples of these which have been unanimously pronounced too salty, when stored for some time, have been found to possess an outstandingly milder flavour, a factor which has to be taken into account at the time of manufacture.

The scientific approach to flavouring problems by Mr. Dunn is of considerable interest.

A Warning to Bakers

Full enquiries should be made by bakers who are offered oil or fat free of permit, to ascertain whether or not they are in order in using such commodities. Briefly, only edible oil may be used in the manufacture of an article of foodstuff or for greasing tins, trays, or other utensils used in the cooking or preparation of food. Further, any type of edible oil may be purchased only against a Ministry of Food permit.

Many cases have been reported recently of bakers being prosecuted for using oil or fat which either has some deleterious effect on the product manufactured, giving cause for action under the Food and Drugs Act, or else does not come within the definition of edible oil.

A clear distinction between edible oil and petroleum or petroleum products is drawn in Ministry of Food regulations, such oils as liquid paraffin, petroleum jelly, technical oils, and slab oil all coming within the latter category, and as such may not be used either as an ingredient in the preparation of an article of food or for tin greasing.

Carrot Oil as Antioxidant

To those who are working on antioxidants, a paper by Erich Heftmann (*Journal of the American Oil Chemists' Society*, **24**, 12, 404), describing a modified technique for the assay of antioxidants and a method for the preparation of carrot oil, may be of interest. The antioxidant effect of carrot oil has been analysed by molecular distillation and chemical treatment of the oil. Tocopherols appear to be chiefly responsible for the protection of the autoxidisable substrate and of carotene from oxidation. The effect of pure tocopherol and of pure carotene, and various mixtures of both, produced by molecular distillation, on the autoxidation of the substrate has been studied. The effectiveness of increasing tocopherol concentrations in reducing the initial rate of peroxidation of the substrate showed a maximum at 5 mg. per cent. tocopherol concentration. Carotene was an inhibitor of this reaction in concentrations of less than 3 mg. per cent., but a pro-oxidant in higher concentrations. The antioxidant activity of the molecular distillate fractions of both the carrot oil and the mixture of pure tocopherol and carotene showed a maximum around a distillation temperature of 190° under the conditions of the experiment. The tocopherol content of carrot oil is considerable; it has been estimated at about 0·5 to 1 per cent.

More than Chaff!

Outbidding production of textile fibres from peanut protein comes an account from the United States of nylon conjured from corn cobs, peanut shells and particularly from oat husks. With furfural prepared from a wide variety of agricultural products, with the Quaker Oats Company passing on to the Du Pont organisation ample supplies as part of a scheme to utilise America's annual total of 100,000 tons of agricultural wastes, possibilities of agriculture providing the body with clothing as well as food become brighter than ever. Oat hulls into furfural and thence *via* furan, tetrahydrofuran, 1-4 dichlorbutane, adiponitrile and nylon—the old impossibility of making a silk purse out of a sow's ear is rivalled by the practicability (the plant is already in being) of silk stockings from so much chaff. If Sydney Smith, who proposed as motto for the *Edinburgh Review*: "We cultivate literature upon a little oatmeal," had been alive, what would he have said to this? No doubt he would have found some connexion between a young man over-spending on his lady's nylons and his "wild oats."

Perhaps from the food point of view we should doubly welcome this conversion of cereal by-products. With the shortage of sisal and hemp for trawler nets one enterprising rope company in the North is now making nets from nylon—at three times the normal price, yet, as nets already fitted for five British trawlers have shown, proving almost indestructible.

TO AUTHORS

FOOD MANUFACTURE is prepared to consider the publication of any books on scientific and technical subjects which authors might care to submit.

Science in Italian Bakery

Resembling in shape a cut-off sugar loaf, neatly wrapped in light blue paper, the Italian cake *panettone* possesses a pleasant taste, considerable nutrient value, and keeping qualities such as enable it to be exported.

"The eye of the master." Signor Angelo Motta inspects the result. He personally supervises the baking of the cake.

THE Motta Company of Milan employs some 3,000 men in making *panettone*, and in good times has an output of 100 tons daily. Up-to-date methods and machinery are in use, and the collaboration of University professors has been enlisted in connexion with all operations.

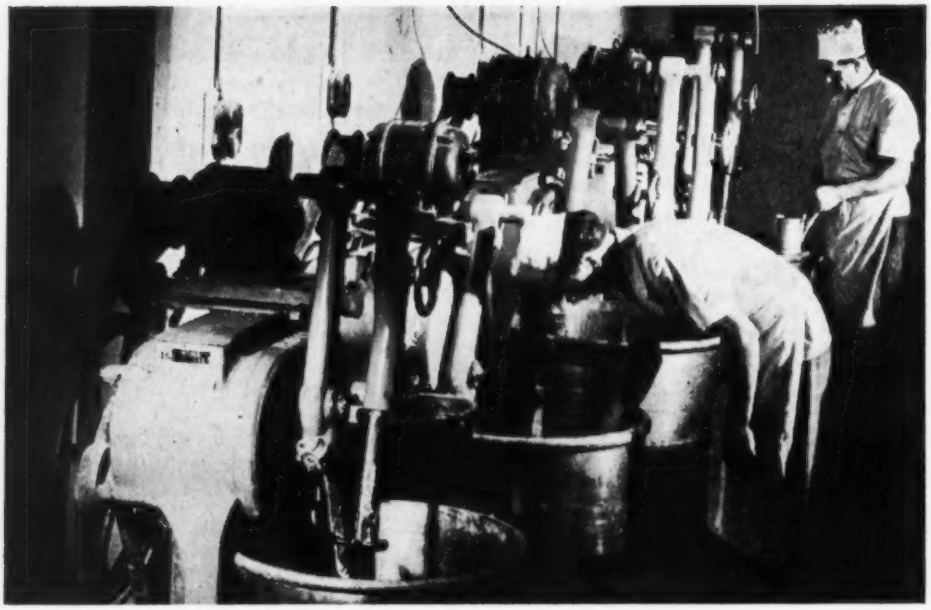
The cake is made of wheat flour mixed with the yolk of egg, butter, sugar, albumen, salt, raisins, and candied citron. Its chemical composition is as follows:

	Per Cent.
Water	15·0
Fat	25 0
Protein	9·6
Sugar	30·4
Other constituents	20·0

Fermentation Process

One of the chief items in the manufacture of *panettone* is the long process of fermentation of dough, during which appreciable amounts of lactic acid are formed which contribute to the special

Yeasts are prepared from special starters.



The ingredients are placed in the automatic mixers.

flavour of the cake. As the successful outcome of the fermentation process depends mostly on the characteristics of the flour used, the factory maintains a special laboratory equipped with a complete set of Brabender apparatus for its testing.

The recent study of individual materials used resulted in the identification of a certain strain of yeast which displays special capacity to multiply in a dough rich in fats, sugars, and proteins. This discovery led to a complication of the fermentation process which necessitated special care in the selection of every raw material, the composition of which was likely to lend itself to the action of the yeast.

Among other ingredients of *panettone* are malt flour and glucose, and a substance to encourage the multiplication of the yeast and to protect the finished cakes from mould. The nature of this substance is zealously preserved as a trade secret, and the most the technicians will say about it is that it is not only dietetically harmless but has tonic properties.

Pre-war Ingredients

In pre-war times, when it was possible to obtain the best products no matter where they were produced, flour of the Manitoba type was purchased from America, egg yolk from China, and best-quality citrons from the African Gold Coast, so that it could be truly said that the product of the Motta factory was a joint product of four of the five continents of the world.

After the second mixing the dough is divided into pieces in accordance with the desired size of the cake.

The unbaked cakes are placed on buttered paper, laid on strips of wood, and conveyed into the fermentation chamber.

The citrons, which arrive in brine, are candied by means of special plant designed by the company's engineers, and are then cut into cubes by automatic equipment.

In the liqueur department of the factory are distilled essential oils which provide aromatic flavouring, the greatest care being taken in the selection of all ingredients.

The Preparation of the Dough

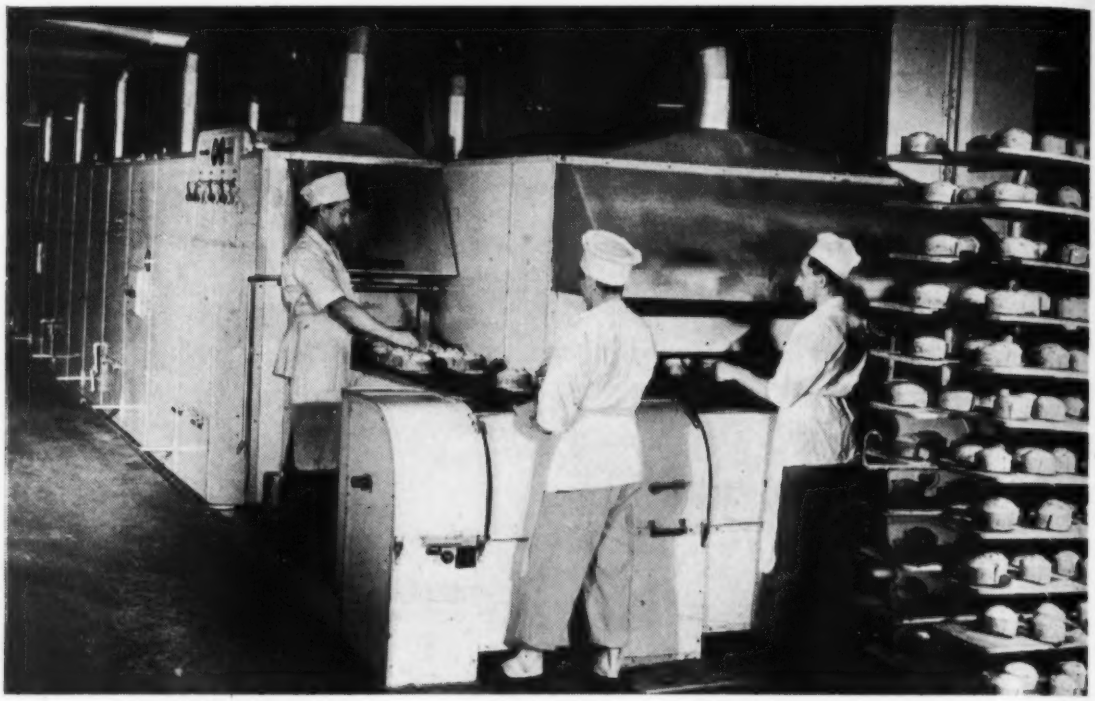
The complexity of the manufacturing process, which takes twenty-four hours to complete, renders it necessary to carry out its various stages in separate departments which are devoted to the preparation of the dough, yeasts, shaping, baking, and packing. Among these departments are special temperature-controlled fermentation chambers.

Yeasts are prepared from special starters, and when this is ready the dough is prepared. In previous times all the ingredients for the cakes were added at this stage, but there was always the risk that the fermentation would be adversely affected by a sudden radical alteration in the medium. This difficulty has now been obviated by the adoption of a two-stage operation, permitting the yeast to pass gradually from its natural element, flour and water, to its ultimate medium.

For the first proving only a part of the total flour, sugar, egg yolk, albumen, and butter is incorporated, the remaining portions of the ingredients with the fruits and essences being added at a later stage. The butter is added in the melted state, the sugar is dissolved in a little tepid water, and flour and water are added last in several separate lots. Mixing of the dough is done by machines, and experience has proved the slower types of European machinery to be more suitable for this operation than the fast American ones.

The Mixing and Baking Operations

The mixing operation takes from twenty to thirty minutes, the temperature of the dough being kept at about 77° F. It is then put into tubs and carried into fermentation chambers where it is left for ten to twelve hours at a temperature of about 86° F. When the dough has approximately doubled its



The cakes are transferred from the trays to the travelling oven.

A batch of cakes is taken from the travelling oven.

volume it is put back into the mixing machines and the remainder of flour, sugar, butter, albumen, yolk of egg, salt, raisins, candied citrons, and other ingredients are added. The essences are added last of all.

The second stage of mixing lasts about forty minutes, and when it is finished the dough is taken out and divided into pieces in accordance with the desired size of the cake. This last operation is performed by hand as all the mechanical systems tried so far have failed to give satisfactory results. The unbaked cakes, placed on buttered paper, are laid on strips of wood and carried into the fermentation chamber, where they are kept for about an hour at a temperature ranging from 95° to 103° F. Skilled operatives then touch up the shape of the cakes, and after another stay in the chambers the sides of the cakes are reinforced by tying strips of paper around them and returned for the last time, the whole second stage of fermentation lasting about eight hours. At the completion of the process the cake is pale cream in colour and is dry to the touch. The top of each cake receives a deep cross-like incision and a band conveyor takes them to the electric ovens which are capable of turning out three tons of cakes an hour.

The baking lasts from twenty to forty minutes according to the size of the cakes, the temperature never exceeding 370° F. After leaving the oven the cakes are placed into baskets and left upside down to cool slowly. Finally, they are taken from their shields of buttered paper and are packed in wrapping of special coloured design.

In spite of being of the nature of fermented goods, the cakes retain their freshness for a considerable time, and, packed in its characteristic export carton, this light and attractively flavoured product is greatly appreciated in different parts of the world.

Palatability of Meat

The third lecture organised by the Institute of Meat and given by Dr. E. C. Bate-Smith, M.Sc., Ph.D., dealt with the palatability of meat.

Dr. Bate-Smith opened his address by explaining that, for the purpose of initial analysis, the subject of palatability might be considered under three headings—toughness, flavour, and "eye appeal" or appearance.

Toughness was of prime importance as its avoidance contributed to the most desirable character in meat. The ultimate fibres of the muscle, which were gathered together into bundles, varied in thickness, and some degree of correlation was observed between tenderness and the thickness of the fibres.

The lecturer made it clear that remarks applicable to raw meat did not necessarily hold good for the cooked article. A shin, for instance, which contained a great deal of connective tissue, improved with suitable cooking as this tended to soften the collagen fibres. With a fillet, on the other hand, which contained very little connective tissue, the reverse would apply.

Turning to flavour, Dr. Bate-Smith said that the chemistry of flavour was quite unknown. However, every effort was being made to remedy this, and a good deal of work was being carried out at the Low Temperature Research Station. It was known that the flavouring substance was contained in the juice, and meat that had lost this juice would also have lost some of its characteristic meaty flavour. There appeared to be a relationship between depth of colour in the flesh and fullness of flavour. That might also be associated with the activity of the muscle. A grazing animal fed on substances containing richly the materials needed for flavour, at the same time being exercised, would tend to give an increase in colour. In consequence, what the lecturer called the "servicing department" of the muscle, through which energy was provided for the contractile fibres, tended to increase both in efficiency and in bulk, and in bringing this about the colour of meat also tended to increase. It was likely that the flavouring substance was to be found in this department of the muscle.

Appearance depended on the type of meat, redness or whiteness of the flesh determining its attractiveness; redness in one type would be as objectionable as whiteness in another. "Marbling" had an attractive appearance, the colour in fat blending well, whereas a pale, blotchy appearance on the one hand, and a too highly coloured appearance on the other would be most unappetising. Curing had a considerable effect on appearance by virtue of the colour change. It also brought about a modification in flavour and had some influence on the tenderness of the meat.

So far, concluded the lecturer, the consumer had appeared only as a somewhat vague figure in the background. Scientists could go ahead measuring all sorts of factors, like toughness, but when it came to facts, what they were really interested in was how the meat eats. They were asking what aesthetic qualities—qualities perceived by the senses—should be expressible in terms of material properties. There was a big gap in exact knowledge as to how the two were related. That the answers could be ultimately obtained in precise terms, because they were already known in rounded terms, was the conviction of Dr. Bate-Smith. The knowledge possessed and expressed in the language of cattlemen and butchers was so well founded that he was sure the results required could be obtained. Competent knowledge rested with individuals, but yardsticks were now needed for absolute accuracy in fixing standards of quality.

Standardisation of Packaging

THERE was no point in discussing how to standardise until it had been considered why it should be attempted and within what limits, said Mr. A. F. Cowan in opening his address on "Standardisation as a Means to an End" to the members of the Institute of Packaging. The ultimate consumer was the one to consider, and every filled package sold created the potential demand for another to be filled. This was an important point, because there could be no lasting purpose in any project which offered advantage to the package maker alone.

The "all-or-nothing" attitude towards standardisation was refuted by Mr. Cowan—he did not wish to standardise everything for everybody. It was necessary to ask what achievement was sought through standardisation, and to look at the end first and the means afterwards.

The end was increased production with less physical effort, because the labour potential was going to shrink. The solution of some of the problems might be to let the machines do the work and let us do more thinking about how to use the machines. The machines should not drive the operator—he should do finger-tip steering.

If it were possible to devise machines which would do without the working operator much more than labour would be saved. With the working operator output varied according to the limit of his skill and endurance, but the machine would not accept sub-standard components and could not be controlled. Once the limitations of the human element were by-passed, the engineer was faced with the purely technical question of improving performance. There were processes which, having passed this critical stage, went to outputs of 300 per minute where previously the human element had pegged it to thirty.

However, fast-moving machinery had to be precise and components had to be accurate. High-speed production could also mean high-speed losses if the quality were not stepped up with quantity.

The lecturer advocated limiting the number of types of container, but asked if shape and size were standardised would individuality be lost. Individuality was certainly required, but this could be achieved through superficial or surface decoration. Identity could be achieved through this, and obviously in some cases the container was part of the product. Shape also could serve as identification. It was no chance that one asked for a bottle of ink or a box of matches. With these reservations in mind, Mr. Cowan was strongly in favour of individuality in surface design.

The task started with the packer or product manufacturer. It was necessary to seek his real need, to stop and listen to him, and then discover the functional characteristics needed to provide the Highest Common Denominator of consumer acceptance. Then the engineers and designers were called in to add it all up and translate it into machines.

Summing up, Mr. Cowan said that the way to set about standardisation was (1) to analyse the point already reached; (2) to know where it was wished to go and why; (3) to take the easy problems first, so building on firm experience; (4) to be content with small beginnings; and (5) to study relationships, since it was impossible to put things into water-tight compartments any more than people.

Electronic Egg Tester

FOLLOWING research on the fertility of eggs undertaken at Cornell University, New York, a new electronic apparatus indicating the degree of freshness of the egg more effectively than candling has been developed.

The egg is introduced into a multiple-coiled bobbin, fed by a high-frequency current. The fresher the egg, the greater is its electric conduction, and the more it absorbs the power given off by the bobbin. A measuring device, indicating the power absorbed by the egg, is graduated according to quality so that one of the four following indications is given: very fresh, good, average, or doubtful. The device comprises essentially a three-element symmetric oscillator, the oscillating circuit being coupled to the bobbin in which the egg has been placed and the measure galvanometer being set up in the circuit of the bobbin. Infertile fresh eggs have a constant insulation which is feebler than fertile eggs, which enables them to be picked out.

In some kinds of apparatus, the indicating galvanometer is replaced by a small lamp which lights up according to the power absorbed by the egg tested. A photo-electric cell can also be attached to the measuring apparatus. To obtain a qualitative appreciation, a four-relay system can be used to show the eggs according to the four categories already mentioned. As each egg passes through the bobbin, it lights the lamp corresponding to the degree of freshness.

Since it is also necessary to know the weight of eggs, the high-frequency bobbins are mounted on a scale, which gives a reading at the same time as freshness is indicated. The measuring apparatus can be adjusted to give the two readings, thus supplying a complete estimation of the value of the egg.

It has been estimated that electronic candling gives almost 100 per cent. precision against 75 per cent. for candle testing, giving excellent results for the selection of eggs prior to drying or conserving.

It is hoped that improvements of the method will enable traces of blood, adherence of yolks, and other local defects to be discerned. In the meantime, the Cornell Research Foundation has received the patent for the invention, which is not yet commercialised.

The Vitamins

Progress in 1947

F. A. ROBINSON, M.Sc.Tech., LL.B., F.R.I.C.
The Distillers Co., Ltd., Research and Development Department, Epsom.

In the survey for 1946, reference was made to the considerable reduction in the number of papers relating to methods of assay and to the vitamin contents of foodstuffs. This tendency has again been evident in papers published during 1947, and the emphasis has now definitely shifted from investigations into the importance of vitamins in human nutrition to their importance in bacterial nutrition. The present year has also been notable for the contributions that have been made to a clearer understanding of the way in which many of the vitamins function; theories have been advanced, for instance, to explain the roles of pantothenic acid and biotin, and further light has been thrown on the functions of pyridoxine and vitamin E.

IT has now been definitely established that pellagra is due to a deficiency of both nicotinic acid and the amino acid, tryptophan. Maize, which is invariably associated with pellagra, contains little nicotinic acid and is deficient in tryptophan, whereas milk contains little nicotinic acid but appreciable quantities of tryptophan. The latter can be utilised by animals and converted into nicotinic acid or amide, thus making up for the absence of nicotinic acid from the components of the diet.

Other outstanding events of the year have been, firstly, confirmation of the synthesis of vitamin A and the announcement that synthetic vitamin A is shortly to be produced commercially; secondly, the report by several groups of workers that riboflavin can be produced economically by fermentation; and, thirdly, the production of synthetic pteroyl glutamic acid for the treatment of various forms of anaemia.

Vitamin A

Syntheses of vitamin A have been reported by D. A. van Dorp and J. F. Arens,[1] working in the laboratories of N. V. Organon, Ltd., in Holland, and by N. A. Milas,[2] working in collaboration with Distillation Products, Inc., of Rochester, U.S.A., who announce that synthetic vitamin A will soon be produced commercially. (See FOOD MANUFACTURE, **23**, 1, p. 23.) This is a statement of more than ordinary importance, for it has been estimated that only one-third of the world's requirements of this vitamin can be derived from fish oils. The method devised by the Dutch workers involves the preparation of vitamin A aldehyde and its reduction to vitamin A; this gave a product containing about 35 per cent. of vitamin A. Milas used a somewhat different method, involving the preparation of dimethylamino-vitamin A.

In the meantime, the search for new sources of vitamin A goes on. A recent publication[3] records the vitamin A content of the liver and viscera oils of fishes caught off the Oregon coast, where soupfin sharks, once a nuisance and now the most highly prized source of vitamin A, are being over-fished. A geometrical isomer of vitamin A has been isolated[4] from the liver oil of the soupfin shark; it has also been shown to be present in cod, dogfish, halibut, and California jewfish liver oils to the extent of 35 per cent. of the total vitamin A. The isomer, designated neo-vitamin A, differs from vitamin A in the spatial configuration around the double bond adjacent to the hydroxyl group, neo-vitamin A being the *cis*-form. It has the same biological activity as ordinary vitamin A.

Kitol, the vitamin A-active material of whale liver oil, has been prepared[5] in crystalline form. It has the formula $C_{40}H_{58}(OH)_2$, double that of vitamin A. On distilling kitol palmitate in a molecular still, 0·7 mole of vitamin A palmitate was formed per mole of kitol palmitate destroyed. It appears that, on being heated, kitol is decomposed into several fragments of different chain lengths: vitamin A is one of these.

Interest in the relative vitamin A activities of the carotenoids and their derivatives continues. It has been claimed[6] that carotene dissolved in "Tween 80" is effectively utilised following parenteral administration. Mutachrome, the epoxide of β-carotene, was found[7] to have less than 47 per cent., and probably less than 39 per cent., of the activity of β-carotene. All-trans-γ-carotene had 26 per cent., neo-γ-carotene P 19 per cent, and the mixed stereoisomers of γ-carotene 16 per cent., of the biological activity of β-carotene.[8] The abilities of different isomers of carotene to promote storage of vitamin A ran parallel to their capacities for promoting growth in vitamin A depleted animals.[9]

Vitamin A_2, which accompanies vitamin A in the liver oil of many fishes and is the predominant form in the liver oils of fresh-water fish, is believed to have some connexion with dark adaptation in fresh-water fish, being converted to retinene$_2$ when the eyes are exposed to light. It has now been shown[10] that vitamin A_2 differs from vitamin A by an additional conjugated double bond in the ring.

There is little to report concerning the nutritional aspects of vitamin A and the carotenoids. The amounts present in retail samples of butter compared favourably with the amounts found in fresh butter.[11] The lowest values—8,000 i.u. per lb. for carotene plus vitamin A and 6,000 i.u. per lb. for vitamin A—were obtained with samples taken in March and April, and the highest values—21,000 i.u. per lb. for carotene plus vitamin A and 16,000 i.u. per lb. for vitamin A—with October samples. A warning has been published[12] against making use of the vitamin A and carotene values of different foodstuffs recorded in diet tables, since these may give misleading results of the biological values of these foodstuffs for man. The site of conversion of carotene to vitamin A in the rat is believed to be the intestinal wall.[13]

Vitamin E

One of the few noteworthy papers relating to vitamin E deals with its effect on milk yields. When a supplement of tocopherol was given to cows the milk fat was increased by 27 per cent. and the total milk production by 21 per cent.[14] Tocopherol has also been shown[15] to exert an effect on vitamin A utilisation; when given at the same time as vitamin A, it increased the storage of the latter.

A further attempt has been made to throw light on the supposed association between vitamin E and muscular dystrophy. It had earlier been reported[16] that in nutritional muscular dystrophy the succinic dehydrogenase activity of the skeletal muscle was increased, and that this returned to normal on administration of α-tocopherol phosphate. It has now been reported[17] that the activity of this particular enzyme is not affected in nutritional muscular dystrophy, and that tocopherol esters inhibit the enzyme activity of both normal and dystrophic muscle to the same extent. Thus, the suggestion that vitamin E is of benefit in muscular dystrophy is receiving less and less support. Nevertheless, confirmation has been obtained of the inhibitory action of α-tocopherol phosphate on the succinic dehydrogenase system,[18] and it has likewise been shown to inhibit diphosphopyridine nucleotide nucleosidase.[19]

Vitamin D

The normal method of making calciferol in this country is to irradiate an ergosterol solution with light from a mercury vapour lamp, and then to separate the calciferol from the other irradiation products by conversion to the 3:5-dinitrobenzoate. There is another process for making vitamin D, the so-called Whittier process,[20] that is based on an entirely different principle; this appears to have received very little attention. In this method ergosterol is distilled at a pressure of less than 1 mm. through a glass activation tube heated to a temperature of 200° C. In this tube the vapours are subjected to a coaxial electrical current of high voltage and low amperage, and then cooled in solid carbon dioxide. The product, known as "ertron," appears to differ markedly from irradiated ergosterol in its biological properties. It has now been shown[21] to contain neo-ergosterol, calciferol and an unidentified steroid. Very unexpectedly, less than one-third of the antirachitic activity of "ertron" could be accounted for by its calciferol content.

Considerable interest has been shown in the treatment of certain forms of tuberculosis with calciferol.[22] In *lupus vulgaris*, it reduced the time of treatment to one-half or one-third of the normal, but some of the patients exhibited signs of toxicity and intolerance. Calciferol did not bring about any improvement in the lungs in twenty-one cases of pulmonary tuberculosis.

Vitamin B Complex

Papers published during 1947 have confirmed the opinion expressed in last year's report that "the aneurin, riboflavin and nicotinic acid requirements of man are normally derived from the diet, whereas the necessary pyridoxine, pantothenic acid, biotin, *p*-aminobenzoic acid and folic acid can be, and often are, supplied by micro-organisms growing in the intestinal tract." The majority of the papers relating to the vitamin B complex published during the year have dealt with the nutritionally less important members of the complex. One reason for this is that they are of considerable interest in microbiology. Schultz and Atkin,[23] for instance, have devised a biochemical classification of yeasts, based on their requirements of the vitamin B factors; and very diverse these are, ranging from *Torula utilis*, which grew satisfactorily without any of the B vitamins, to *Kloeckera brevis*, which required inositol, pantothenic acid, biotin, aneurin, pyridoxine and nicotinic acid. Wide variations were observed in the vitamin requirements of different strains of the species *Saccharomyces cerevisiae*. A wide variation in vitamin requirements was also observed[24] in 250 strains of *Lactobacilli*; these appeared to be correlated with the ability of the different strains to ferment different sugars.

Another reason for the sustained interest in pyridoxine, pantothenic acid, biotin, *p*-aminobenzoic acid and folic acid is that much remains to be discovered concerning their functions in the living organism, whereas the roles played by the other members of the vitamin B complex have been known for some time. The year under review has witnessed striking advances in our knowledge about these "minor" members of the vitamin B group, while interest in the group of "major" vitamins has

centred round their fate in the body, particularly in relation to the detection of vitamin deficiency.

Aneurin

The urinary excretion of aneurin was found[25] to be an individual characteristic, two- to three-fold variations being observed in the amounts excreted by humans maintained on the same constant diet. Excretion of the pyrimidine half of the aneurin molecule, on the other hand, was much more constant and, within certain limits, gave a truer indication of aneurin deficiency. Nevertheless, the urinary excretion of aneurin appears to be related to intake and, in order to calculate the daily minimum requirement of aneurin, it is recommended[26] that the urinary output should be subtracted from the intake. On this basis the male requires 0·44 mg. per 1,000 Cals. on a diet supplying 2,400 Cals. per day. The faecal aneurin can be ignored, as it is derived almost exclusively from bacteria in the gut. The aneurin intake for women recommended by another group of workers[27] was found to be of the same order—namely, 1·1 to 1·2 mg. per day. A new method of estimating aneurin deficiency was suggested by E. Papageorge and G. T. Lewis.[28] In this, the "fasting hour," test an estimate is made of the aneurin excreted in a specimen of urine collected in the hour immediately following the completion of a 24-hour period and after an overnight fast. The test is said to be particularly useful in nutritional surveys. The effects of vitamin deficiency induced by prolonged feeding of a diet low in aneurin and riboflavin have been described by Horwitt *et al.*[29] The nutritional value of flour is said[30] to be greatly improved by the addition of 1 μg. per g. of riboflavin and the same amount of aneurin, and still further by the addition of pyridoxine and pantothenic acid.

Riboflavin

Important advances have been made in the production of riboflavin by fermentation. Hitherto this substance has been made synthetically by a method involving seven or eight distinct stages, but such high yields are now being obtained in the fermentation process as to leave little doubt that this will ultimately displace the chemical process. Thus, yields of 20 mg. per g. of solids or about 500 mg. per litre of fermentation liquor have been claimed using the moulds *Eremothecium ashbyii*[31] and *Ashbya gossypii*.[32] Riboflavin is also produced in good yield by *Candida flareri*[33] and by a butyl alcohol-producing bacterium.[34]

The symptoms of riboflavin deficiency in the dairy calf have been described.[35] Cattle can obtain riboflavin either from the diet or from bacteria in the rumen or intestine. In a study of the riboflavin excretion of young women maintained on a diet containing known amounts of riboflavin and nitrogen, it was shown that the amount excreted in the urine varied inversely with the nitrogen balance. When this was negative, excretion was high, and when positive, it was low. The faecal riboflavin bore no relationship either to the diet or to the nitrogen balance, being derived from the intestinal bacteria. It is now becoming clear that bacterial synthesis of aneurin, riboflavin and nicotinic acid takes place in the intestine in man, but the vitamins so produced cannot be utilised by the host, except on rare occasions. Other members of the vitamin B complex are also synthesised by intestinal bacteria, but are apparently available to the host under normal circumstances.

Nicotinic Acid

Further evidence has come to light concerning the close association between nicotinic acid and tryptophan, to which reference was made in the last survey. Thus, Krehl *et al.*[36] appear to have confirmed that pellagra is associated with a maize diet, simply because zein, the protein of maize, is deficient in tryptophan, while Kodicek *et al.*[37] have shown that the indole-3-acetic acid in maize is not responsible for its pellagregenic activity, as had previously been suggested. Singal *et al.*[38] showed that when rats were given tryptophan they excreted increased amounts of nicotinic acid and nicotinic acid derivatives, and they therefore suggested that a true biosynthesis of nicotinic acid, as opposed to a bacterial synthesis in the intestine, occurs in man. This is supported by the observation of Najjar *et al.*[39] that administration of sulphasuxidine, which suppresses the growth of the intestinal flora, did not reduce the amount of nicotinic acid derivatives excreted by human subjects fed a diet deficient in nicotinic acid. Similarly, Schweigert *et al.*[40] obtained an increase in the amount of nicotinic acid and N^1-methylnicotinamide excreted by horses and cotton-rats respectively on administration of tryptophan. Sarett and Goldsmith[41] and Perlzweig *et al.*[42] obtained similar results with human subjects, and the former suggested that the beneficial effect of milk, which contains only a little nicotinic acid, is due to its relatively large content of tryptophan. In the rabbit, 400 mg. of *dl*-tryptophan are biologically equivalent to 10 mg. of nicotinic acid.[43] Ornithine is suggested[44] as a possible precursor of nicotinamide. It has long been known that nicotinic acid and its amide can be converted by animals into various metabolites, including nicotinuric acid, trigonelline and N^1-methylnicotinamide. To these must now be added dinicotinylornithine[45] and the 6-pyridone of N^1-methylnicotinamide,[46] thus further complicating attempts to obtain nicotinic acid balances in feeding experiments.

Nicotinic acid is not an essential vitamin for the cow, and the necessary nicotinic acid is not derived from the intestinal flora.[47]

Pyridoxine

The year under review has witnessed a further clarification of the role of pyridoxine, about which

there has been considerable controversy. It appears to be definitely established that pyridoxal phosphate is a coenzyme, not only for the decarboxylution of amino-acids, but also for the transaminases, which effect the transfer of an amino-group from an amino-acid to a keto-acid with formation of a different amino acid. Schlenk and Fisher[48] showed that pyridoxal phosphate was present in purified preparations of glutamic-aspartic acid transaminase, while O'Kane and Gunsalus[49] obtained a complete separation of this enzyme into its apoenzyme and coenzyme, and showed that pyridoxal phosphate would reactivate the apoenzyme. Pyridoxal phosphate was also shown[50] to be the coenzyme of a related enzyme, tryptophanase, which degrades tryptophan into indole and pyruvic acid. Pyridoxal was also necessary for the conversion of indole and anthranilic acid into tryptophan by *Lactobacillus arabinosus*.[51] These observations may be connected with the fact that pyridoxine is in some way bound up with the conversion of tryptophan into nicotinic acid. Schweigert and Pearson,[52] for instance, showed that vitamin B_6-deficient animals excreted far less N^1-methylnicotinamide than normal animals when both were given additional tryptophan, and Porter *et al.*[53] reported that tryptophan metabolism was markedly affected when analogues of pyridoxine were administered to vitamin B_6-deficient rats.

Pantothenic Acid and Biotin

Pantothenic acid has now been identified[54] as the prosthetic group of a coenzyme that acetylates aromatic amines and choline, but it is not yet clear to what extent this hypothesis provides a satisfactory explanation of the biological properties of pantothenic acid.

Biotin is another member of the vitamin B complex, the function of which is now beginning to be understood. Stokes *et al.*[55] showed that in certain micro-organisms biotin led to the synthesis of aspartic acid, while Lardy *et al.*[56] showed that the inability of biotin-deficient bacteria to synthesise aspartic acid was due to their failure to effect the condensation of pyruvate and carbon dioxide to produce oxaloacetate.

Biotin as a Cocarboxylase

Further evidence in support of the role of biotin as a cocarboxylase was obtained as the result of work with biotin analogues capable of antagonising the growth-promoting action of biotin in bacteria. This is a principle that has often been used to elucidate the functions of members of the vitamin B complex, and has frequently been referred to in previous surveys. Shive and Rogers[57] showed that 2-oxo-4-imidazolidine-caproic acid prevented the synthesis of biotin by *E. coli* by competing with desthiobiotin, its precursor. The effect of the antagonist was overcome by α-ketoglutaric acid and by glutamic acid, and it was, therefore, suggested that biotin is concerned in the synthesis of α-ketoglutaric acid from oxalosuccinic acid, as well as in the analogous synthesis of oxaloacetic acid.

Folic Acid

As described in the previous survey, considerable progress was made during 1946 in unravelling the complicated story of folic acid. Nothing has happened during the year now under review to call for a revision of the conclusions reached twelve months ago. Synthetic pteroylglutamic acid is now an article of commerce, although not yet generally available in this country. It continues to be used successfully in the treatment of pernicious anaemia, tropical macrocytic anaemia, sprue and other haematological disorders.[58-60] Using mosquito larvae —for which folic acid is an essential growth factor— as test organism, Golberg *et al.*[61] showed that the pteroylglutamic acid contents of liver extracts used in the treatment of pernicious anaemia did not account for their clinical activity. The response of pernicious anaemia patients to liver extracts was followed by a greatly increased excretion of pteroylglutamic acid, but, by contrast, normal subjects showed no change in their pteroylglutamic acid excretion.

Now that the structure of folic acid is known, analogues are being prepared and their biological activities are being examined. Methyl folic acid, for instance, was shown to antagonise the growth-promoting effect of folic acid on bacteria,[62] while a number of 2 : 4-diamino-pterins[63] and pteroylaspartic acid[64] had similar properties.

As might be expected, these antagonists are being used to investigate the biological function of pteroylglutamic acid. Although it is too early to expect any definite information on this point, it is already known[63] that certain antagonists exhibit a different type of action from the sulphonamides and, indeed, may exert a synergistic action with the latter. The sulphonamides are believed to interfere with the synthesis of folic acid, while the inhibitory pterins probably compete with the formation of an enzyme of which folic acid is the prosthetic group. In any event, the results so far obtained suggest that some of these folic acid analogues may be of therapeutic value, possibly reinforcing the antibacterial action of the sulphonamides. It is obvious, too, that the role of *p*-aminobenzoic acid—long recognised as a growth factor for bacteria and the substance with which sulphonamides compete in exerting their antibacterial effects—is somehow bound up with the role of folic acid. It has been suggested[65] that the sulphonamides interfere with the conversion of *p*-aminobenzoic acid into pteroylglutamic acid.

Vitamin C

Interest in vitamin C appears to be on the wane, although vitamin C deficiency is still the most frequently encountered of all the vitamin deficiencies. It has been noted, for instance, that vitamin C was

the only vitamin deficient in prison or Borstal diets,[66] with the possible exception of vitamin A. The vitamin C requirements of normal adults have been given as about 70 mg. per day,[67] but for adolescents, sufficient should be given to maintain the body nearly saturated.[68] A modification of the indophenol titration method has been introduced[69] to enable vitamin C estimations to be carried out on dehydrated vegetables, in which caramelisation interferes with the normal procedure. A study of the distribution of ascorbic acid in the cabbage and of the amount of ascorbic acid in different varieties, and at different seasons and in different localities has been made.[70] About 60 per cent. of the vitamin is lost in the process of dehydration, but no further loss occurs during storage and very little on cooking, if proper precautions are taken. The ascorbic acid content of English apples is higher than had previously been supposed, up to 22 mg. per 100 g. being present.[71] Ascorbic acid is much more stable in fruit juices than in aqueous solutions, and apple juice is considered to be a particularly favourable vehicle for giving ascorbic acid.[72] What a pity that this commodity is generally unobtainable in this country!

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Fruit and Vegetable Preservation

In his introduction to the annual report of the Campden Research Station for 1946, Mr. F. Hirst, the Director, gives news of the welcome return to more normal conditions in its activities. The work on the examination of commercial packs of canned fruit and vegetables, which during the last seven years had been confined largely to the checking of filled weights and syrup densities, had been extended, and a voluntary scheme for improving the quality, approved by the fruit and vegetable canners, was put into operation. The main object of the scheme was, in the first instance, to encourage canners to have their packs adequately sampled and tested for quality at the Research Station, and it was encouraging to note that almost all the canners concerned were participating and sending samples for examination.

Owing to the pressure of other work and to the shortage of paper, no canners' bulletins were issued during the six years of war. With the return to more normal conditions, it is intended to rewrite existing bulletins where necessary and to publish new ones as soon as possible. During the past few months the bulletin on "The Use of Sugar Syrups in Canning" has been rewritten and published, and a new one on "The Treatment of Waste Waters from Fruit and Vegetable Canneries" will shortly be available.

The advisory work of the Research Station, which includes the answering of technical enquiries, the investigation of problems submitted by canners, the examination of raw materials and finished products, and the imparting of information to visitors, has again occupied much of the time of the very limited scientific staff. The Station has continued to act for the Ministry of Food in supervising the work of the Ministry's Inspectors and in examining canned beans in tomato sauce for quality and composition.

A large number of canning and bottling trials and other practical experiments were made during the year. These were concerned with varieties of fruit for canning, quality of canned fruit, vitamin C in blackcurrant pulp, effect of organic spray residues on blackcurrants, hydrogen swells, fruit gumming of plums, effect of incubation on *p*H of canned vegetables, maturity of canned peas, and disposal of factory effluents.

In a paper on the inspection of canned fruit and vegetables for quality, Mr. W. B. Adam briefly describes the new scheme for inspecting and grading canned fruit and vegetables which has been adopted tentatively by the industry.

In connexion with grade classification, samples are graded on a score-card basis and a dual system is used in allotting the grade, there being separate minima allowed for item scores as distinct from total scores. The features constituting the five items included in the score card are colour, texture, absence of defects, size-grading (except in certain vegetable packs), and flavour. The scoring of these items is described in detail.

The first samples to be examined under the new scheme were received in the middle of July, 1946. The scheme as a whole has worked well both as regards the arrangements for collecting samples from the canneries and the way in which the scoring system has operated in practice.

Mr. Denis Dickinson presents his final report on the internal corrosion of cans, which forms the fourth article in the series which have been directed towards the diagnosis of the cause of any particular instance of abnormally rapid corrosion in canned fruit.

Following on previous work on the subject, Mr. T. G. Gillespy describes studies on the mould *Byssochlamys fulva*. Records of heat resistance studies have been re-examined and a summary is presented in the paper, together with some further studies on the effect of sulphur dioxide on *B. fulva*. The effect of sulphur dioxides on ascospores has been reviewed and some new work reported, which shows that the lethal concentration is a function of the hydrogen ion concentration of the medium, and that non-ionised sulphurous acid is probably the lethal factor.

Another paper by Mr. Gillespy is an introductory article on the heat resistance of the spores of thermophilic bacteria. This first instalment discusses the meaning and implications of the terms "thermal death rate" and "temperature coefficient" as applied to the destruction of bacterial spores by moist heat, with illustrations from laboratory results obtained with a strain of thermophilic anaerobe.

A final paper by Messrs. W. B. Adam and D. Dickinson discusses the dry solids and sugar content of processed peas.

The Vitamins

(*Concluded from page* 111)

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Electronic Instruments in the Sugar Industry

A review of the many types of control apparatus used in the sugar industry as necessary adjuncts to the efficient and precise control of each step in the process of the maximum production of crystallisable sucrose, and of the application of electronic devices already developed which, with modifications, could conveniently be applied to the sugar industry.

THE history of the sugar industry, as indeed with every other industry, is closely interwoven with methods of measurement of the various factors which play vital roles in the production of the final product. The rule-of-thumb procedures employed by the old craftsmen have largely disappeared, and the "art" of sugar manufacture is now quite definitely a science. Once the industry was put on a scientific basis, rapid strides were made and will continue to be made, for there is much to be done in endeavouring to produce yet more crystallisable sugar from the raw material at present available. Any improvement in the yield and sugar content of the latter will be of additional advantage, but it is felt that much good work done in the field is not as yet fully utilised. Measurement is the greatest aid to this goal; indeed, not only measurement as such but more precisely exact measurement.

The accurate estimation of the various factors such as the hydrogen ion concentration, colour, ash content, and sucrose content, has from time to time presented difficulties. These problems have, in the main, been overcome and suitably designed apparatus made available. It is now intended to detail four respects in which electronic instruments have found wide acceptance: (1) *p*H determinations on sugar-house products; (2) determination of ash; (3) estimation of colour, particularly of thin clarified juices and syrups; and (4) detection of sugar by the Molisch test.

Hydrogen Ion Concentration

In the early days of sugar production, the amount of lime to be added to the acid juice from the cane was very much a matter of guess-work. The optimum amount to be used was judged by the behaviour of the filter-press section, and also the amount of coloration imparted to the juice after concentration. It is a well-known fact that heating an alkaline solution of glucose above 60° C. produces dark-coloured compounds which are detrimental to the production of a good quality sugar. On the other hand too acid a juice will result in inversion of the sucrose, thereby causing loss in the yield of crystallisable sugar. The juice will be, however, much lighter in colour in this latter case. One was thus left to use very questionable methods of control. Furthermore, varieties of canes crushed from different sources with perhaps very varying soil conditions made these methods extremely difficult of application for efficient operation. In fact, the whole procedure was most unsatisfactory.

The introduction of *p*H control in the sugar industry is only of comparatively recent origin. Brewster and Raines[1] of the Sugar Experiment Station, New Orleans, La., were perhaps the first technologists to suggest the use of *p*H control for the liming of cane juices. Further to the neutralisation of the acid, practised only in the case of raw sugar factories, it was found desirable to add an excess, the amount depending on the method of clarification employed. The excess alkalinity was then reduced by the addition of carbon dioxide or sulphur dioxide gas. The resultant juice was much purer and of a suitable quality for the production of "plantation white" or off-white sugars.

The Glass Electrode System

In order to control within rather well-defined limits the excess addition of lime, the use of indicators was found to be of great benefit. Later, indicator test papers were introduced and the control was speeded up somewhat. These methods were still not quite satisfactory and on the whole too slow and liable to errors. The laboratory testing of the *p*H of sugar products was rendered difficult when coloured materials were used, and one had again to resort to a more refined guessing procedure. It was clear that improved methods for the estimation of hydrogen ions were necessary, and the answer was found in the discovery of the glass electrode system.

It is now common knowledge that when a glass film is brought into contact with a solution a minute potential is produced at the liquid glass interface. The magnitude of this charge was found to depend only on the *p*H of the solution. Here,

Paper read by S. Gordon Smart, A.R.T.C., A.R.I.C., at a joint meeting of the Chemical Engineering Group of the Society of Chemical Industry and the Institution of Chemical Engineers on October 3, 1947.

The "Ionometer" *p*H meter. The electrode assembly shown in Fig. 1 below replaces the old type. A, insulator; B, glass electrode membrane; C, KCl bridge; D, calomel half-cell reservoir for KCl; E, stopcock; F, sample cup; G, small hole for filling calomel to electrode; R, small breather hole.

Courtesy The Sugar Manufacturers' Supply Co., Ltd.

then, was an ideal method for the estimation of this constituent if suitable electrical measuring equipment could be found which was reasonable in cost. The answer to these problems was found in the utilisation of electronics, a valve being used as an amplifier, and the increased charge could then conveniently be read on a meter. The principles on which electrometric *p*H determinations are based are thus the production of a minute p.d. across the liquid glass interface; the small current thereby produced is conveyed through a good conducting solution contained in the bulb of the glass electrode and thence to a metallic conductor which dips into this solution; the charge is then fed to the grid of a suitable type amplification valve in the circuit of which is included a milliammeter. Any alteration in the *p*H of the test solution will cause a varying p.d. to be set up and thus affect the meter reading to an appreciable degree, depending on the amplification employed.

By using the glass electrode one eliminates salt and protein errors, and the presence of poisons has no effect on the accuracy of the determination. Accurate results are obtained with a single calibration of the *p*H meter from 0 to 10. Alkalinities in excess of this value require a special calibration with a solution of the same *p*H approximately, and also salt concentration. This is due to the fact that a straight line relationship holds good over the range 0 to 10, between *p*H and millivolts, while above this figure this relationship is somewhat disturbed. This disturbance is probably brought about, in part, by attack on the glass electrode by these alkaline conditions.

The design of a suitable *p*H meter has naturally to pass through many stages before a satisfactory model is obtained which is stable electrically under general conditions of use. In the design of the present model of the "Ionometer," for example, it was found that screening of the leads was very important. One instrument recently supplied had to operate satisfactorily when only 3 feet away from the "Ionometer" was located an electric radiator and an electric light about 4 feet above. During the winter months the radiator was in continuous use. In addition to this there was a 25 h.p. motor on the floor above about 10 feet to the side; a 120 h.p. motor operated through the wall from the laboratory and roughly 12 feet from the spot where the instrument would have to work. Under these conditions the instrument has worked satisfactorily, and this will give some idea of the stability of the apparatus and of the need for screening. Under more arduous conditions it may be imperative to screen both leads, one from the glass and the other from the calomel half-cell electrodes. At the same time precautions would have to be taken against possible electrical pick-up through the electrodes themselves by placing the electrode assembly within a suitable screen during the tests.

The gravimetric determination of ash in sugar-house products is an extremely laborious and time-consuming operation. This process has now been very much speeded up and simplified by the use of electronic devices commonly known as the ash bridge, such as the "Salometer." It is estimated that each ashing determination normally takes two to two and a half hours, whereas by the use of the "Salometer" as many as twenty to thirty results may be obtained in this time.

The principle on which this apparatus works is one of tuned circuits which become out of phase when different resistances are included in the cir-

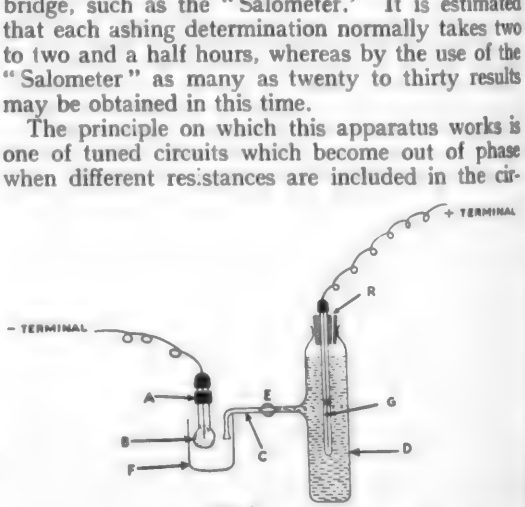


FIG. 1.

cuit, thereby causing a reaction in the magic eye. When various solutions are introduced into the cell containing the electrodes, the circuit is again brought into resonance by means of a graduated variable potentiometer. The resistance calibration so obtained, when substituted in the appropriate formula, enables the ash content to be calculated readily and speedily.

Visual Detection

In its latest form the instrument employs the magic eye for the determination of the null point. In its earlier design a pair of headphones was used in conjunction with a hummer unit. The end point, when the sound in the phones was silenced, was rather difficult to obtain due to the presence of harmonics, and for this reason relative quiet was essential for accuracy. Such conditions do not usually prevail in an industrial laboratory, and it would be preferable to have a visual means of detection. It was thus decided to have an alternative method for those working under noisy conditions.

The instrument is operated off A.C. mains, and for its proper operation a comparatively stable source of supply is desirable. This, unfortunately, is not always the case at sugar factories, as the current has been known to fail completely while certain of the processes are being carried out. In order to overcome this defect a model designed to operate off a 6 or 12 volt battery is available. Alternatively the headphones model has been modified to give a purer note by means of a valve oscillator and the end point determination is much improved by this means.

Colour Estimation

In the factory manufacturing white sugar, and more particularly the refinery, colour is of some considerable importance. Electronic methods here, too, find application in a speedy and extremely satisfactory solution to the problem. The device employed for this purpose is the photo-electric cell. The design of such instruments offers no particular difficulties except in the choice of a suitable and stable photo-tube. The instrument consists essentially of a photo-electric cell suitably connected to a sensitive galvanometer or recording device and a source of monochromatic light. Between the light source and the cell is inserted a transparent container or conduit for the liquid under test. Thus a tedious determination is made entirely automatic and the human element is eliminated in colour estimation. The duplication of results is good and better than with optical methods.

With regard to the particular use for such instruments it may be stated that they can be employed in controlling the use of liquor from a char system or simply to record the colour variation of the liquor issuing from such a system, or from the clarification station.

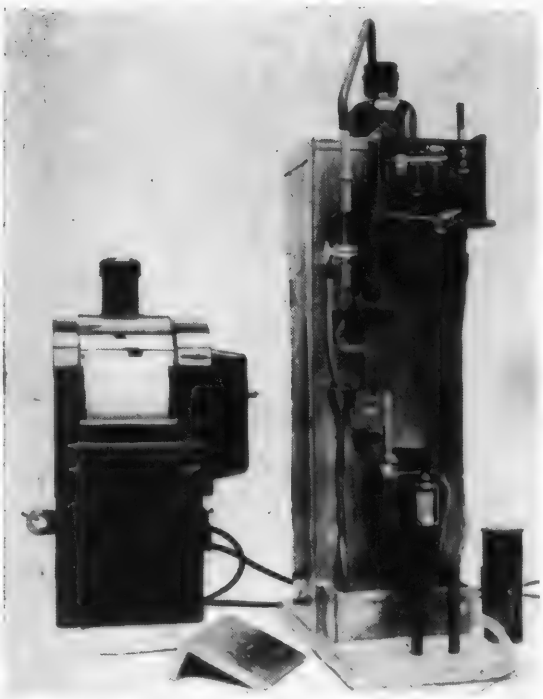
Molisch Test for Sugar

For the detection of sugar in condenser water from the pans and evaporators the Molisch test is usually employed. When, to a solution containing sucrose, a mixture of alpha-naphthol and concentrated sulphuric acid is added, a pink coloration is obtained on mixing. The depth of colour produced is a measure of the amount of sugar in solution.

This test is carried out with a view to the detection of leaks in the evaporator or pans and of excess entrainment. The engineer is particularly interested in this estimation as most of the condensed steam is returned for boiler make-up. The presence of sugar in excess of a certain maximum amount results in priming of his boilers and a drop in the efficiency of steam production. It is important, therefore, that a more or less continuous record of sugar in condenser water be obtained. In answer to this problem an apparatus known as the "Sucro-Tec" or "Sweet Tester" was patented in 1936 by H. C. S. de Whalley and J. D. Atkinson of Tate and Lyle, Ltd., employing the photo-electric cell for colour variation based on the Molisch test.

This apparatus does not give a continuous reading, but rather a series of determinations at regular small-time intervals which may be altered at will between certain fixed limits The equipment consists of various Warren motors controlling the addition of the sulphuric acid/alpha-naphthol mixture and condenser water, a special reaction chamber,

The "Salometer" ash bridge.
Courtesy The Sugar Manufacturers' Supply Co., Ltd.



The "Sucro-Tec" gives a series of determinations at regular small-time intervals.
Courtesy Tate and Lyle, Ltd.

and finally the measurement of the depth of colour produced by the interaction of the mixed reagent on the sugars present by the photo-electric cell and its subsequent recording on a chart graduated in parts per million. Visible or audible alarms may be fitted to give warning when the sugar content in the condenser water exceeds a certain predetermined level.

Trends in Instrumentation

Modern industrial plants demand greater accuracy and sensitivity of the instruments employed in the controlling of processes. With the increasing costs of raw materials the accent is on the most efficient production technique and principles giving positive control of these processes. In the sugar industry the introduction of such devices has been of great benefit. The growing demand is for continuous sampling and recording, and many interesting but essential problems at once present themselves. Among these may be mentioned stability, accuracy, sensitivity, and elimination of external interference especially due to pick-up. The secret in design lies principally in the stability of the instrument over long periods of time. Unstable conditions render the precise control of the process extremely difficult, if not impossible. Next in importance is perhaps adequate screening against any possible pick-up of stray electrical disturbances which render the instrument inaccurate. Unless one is working with a thoroughly reliable instrument, wrong conclusions may be drawn.

The ultimate goal of instrumentation is automatic control. Such devices lead to the most efficient operation of the plant, and the sugar industry has greatly benefited by the installation of automatic liming. Then again it has been reported that pan boiling can now be done by the aid of instruments alone, which, if satisfactory in operation, will prove to be of major importance.

Future Applications of Electronic Devices

So far control equipment only has been considered. Perhaps now it would not be out of place to give a thought to possible future applications of already developed principles so that greater speed with accuracy may be attained. The first of these which comes to mind is the utilisation of high frequency heating. As yet, no information is available on its use for the drying of sugar-house products. It is known that the method is rapid in operation and that water is expelled from the inside of the mass outwards. If it can be established that this form of heating can more or less selectively drive off the water without destruction of the "reducing sugars," or at least with the minimum of destruction, then a method for the accurate control and possibly the actual drying of sugars in bulk will be available.

At present the customary procedure in the laboratory is to dry samples of sugar and bagasse —the refuse from milled cane—in an air or steam oven for periods of from two to four hours. It has been reported that under these conditions of heating reducing sugar is destroyed.[2] Also, since the determination of water in bagasse is an important one, forming as it does a basis for the control of the milling operation, the more samples one is able to handle in a given time the truer will be the average result.

In the factory high frequency heating could conveniently find a place at the drying end of the plant. The equipment used consists essentially of a rotating drum through which heated air is passed. The crystals are scooped up along the circumference of the drum and allowed to fall through the heated air on their way down the whole length of the drier. Such treatment detracts from the market value of the sugar so produced for two reasons: (1) The sugar dust formed by the rubbing of the dried crystals adheres firmly to the sticky surface of slightly wet crystals giving a dull appearance, and (2) the crystals themselves are fractured with the consequent elimination of "sparkle."

By the utilisation of high frequency heating the vigorous motion of the crystals would be entirely eliminated. The sugar would be conveyed on an endless belt between a series of electrodes, and after

cooling, bagged immediately. Again, a source of sugar dust explosions would also be eliminated.

Another application of simple electronic equipment is in the control of automatic weighing, sewing of the bags, and counting of these on their way to the store. Such applications, of course, will only be considered when labour is hard to obtain or is expensive in relation to the nature of the work in which it is to be employed. The mechanisation of factories has not advanced to this point due mainly to the abundance of cheap labour in many parts of the world. However, there may come a time when the factory executives will be forced to consider more or less complete mechanisation of their plants. In such instances, the men employed would inevitably be fewer in number but necessarily much more highly skilled and practically each one a technician. The actual labouring and the control of operations would be carried out by instruments and machines under the supervision of one or two operators whose sole job would be to see that the instruments were maintained in good working condition. It is to be hoped that fuller instrumentation of plants will be carried out with all possible speed, for it is in the interest of the technicians themselves that this should be so, helping, as instruments do, the process of complete control of the quality of the final product and releasing manpower for other more vital work. In this way the maximum yield at minimum cost is achieved.

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Ministry of Food

Latest Statutory Rules and Orders

The list given below is the continuation of the list of Orders published in *Food Manufacture*, February 1, 1948, page 84.

No.	*Date.* 1947.	PRICE FIXATION ORDERS
2755	Dec. 22.	Order amending the Fish (Control and Maximum Prices) Order, 1947.
2772	„ 23.	Order amending the Dredge Corn (Control and Prices) (Great Britain) Order, 1947, and the Dredge Corn (Control and Prices) (Northern Ireland) Order, 1947.
2773	„ 23.	Order amending the Home Grown Beans (Control and Maximum Prices) (Great Britain) Order, 1943.
2774	„ 23.	Order amending the Wheat (Control and Prices) (Great Britain and Northern Ireland) Orders, 1947.
2775	„ 23.	Order amending the Barley (Control and Prices) (Great Britain and Northern Ireland) Orders, 1947.
2777	„ 23.	Order amending the Condensed Milk (Control and Maximum Prices) Order, 1943. Revokes S.R. & O. 1947, No. 715.
2787	„ 24.	Order amending the Home Grown Beans (Maximum Prices) (Northern Ireland) Order, 1942.
2788	„ 24.	Order amending the Oats (Control and Prices) (Great Britain and Northern Ireland) Orders, 1947.
2789	„ 24.	Order amending the Feeding Stuffs (Maximum Prices) Order, 1946.
2817	„ 30.	Order amending the Raw Cocoa (Control and Maximum Prices) Order, 1946.
2840	„ 31.	Order amending the Animal Fats (Control and Prices) Order, 1946.

No.	*Date.* 1947.	FEEDINGSTUFFS
2776	Dec. 23.	Order amending the Feedingstuffs (Rationing) Order, 1943.
2816	„ 30.	Order amending the Feedingstuffs (Regulation of Manufacture) Order, 1947.
		LABELLING
2709	Dec. 18.	Order amending the Labelling of Food Order, 1946.
		PERSONAL POINTS
2786	Dec. 24.	Order amending the Rationing (Personal Points) Order, 1947.
		POINTS RATIONING
2839	Dec. 31.	Order amending the Food (Points Rationing) Order, 1947.
		PRESERVES
2842	Dec. 31.	Order amending the Preserves Order, 1947.
		RATIONING
2619	Dec. 5.	The Christmas Food Directions, 1947.
2620 S.96	„ 5.	The New Year (Scotland) Food Directions, 1947.
2685 S.98	„ 15.	Order amending the Christmas and the New Year (Scotland) Food Directions, 1947.
2795	„ 29.	Order amending the Fats, Cheese, and Tea (Rationing) Order, 1947.

Mayonnaise and Related Products

S. M. TRITTON, F.R.I.C., M.P.S.

Mayonnaise and salad cream belong to the class of condiments the use of which is steadily increasing under modern methods of culinary practice, and products of varying composition have been manufactured for many years in the United States, Germany, and this country.

STANDARDS were first established in Germany which required that mayonnaise should contain 83 per cent. oil and salad dressing 65 per cent. These standards were lowered in 1935 to 50 per cent. oil for mayonnaise and 40 per cent. for salad dressing. Wheat flour or farina was permitted as a stabiliser, rising from 5 per cent. in 1935 to 10 per cent. in 1941, or 4 per cent. gelatine was permitted. Gums, agar, or similar products were inadmissible, but additional egg or fish albumen could be used in manufacture without specific declaration.

American and British Standards

Standards were laid down for salad cream and mayonnaise in the U.S.A. in 1929, and in 1942 it was required that the product be labelled to show all ingredients with specific mention of artificial colour or flavour or of chemical preservative present. The type of cereal starches did not need to be declared. It was specified that the vegetable oil content of a mayonnaise be at least 50 per cent., and any anti-oxidant present had to be declared as a chemical preservative.

Standards for salad cream or mayonnaise were proposed for Great Britain in July, 1945, and became law in November, 1945, by which the product should not contain less than 25 per cent. by weight of edible vegetable oil and not less than 1·35 per cent. by weight of egg yolk solids.

The standard does not apply to a description other than salad cream or mayonnaise when (*a*) the product is sold by a caterer as part of a meal or (*b*) where there is given with the product a label bearing a prescribed statement to the effect that the product is not a standard article. Mayonnaise and salad cream are exempt from the Labelling of Food Order, but not any other salad dressing, salad sauce, or sandwich spread. It is further explained in the Order that a salad dressing complying with the standard also is exempt from a declaration of ingredients.

The Chief Ingredients

The chief ingredient of these products used to be oil, but since the lowering of standards the quantity of oil used can in certain cases be reduced to less than 50 per cent. Nevertheless, it is oil that makes the dressing, and the utmost care must be used in the choice and quality of oil. At one time all salad dressing contained olive oil, but this has largely been superseded by groundnut oil, corn oil, and cottonseed oil. Although olive oil is the usual ingredient of home-made mayonnaise, it is not generally used in industrial manufacture on account of its greater expense and tendency to become rancid.

Peanut oil is suitable for mayonnaises, provided it has been winterised or chilled to remove fatty acids, and some deodorisation is advocated.

Sesame oil is not now normally used for salad dressings on account of cost, but makes a palatable product.

Cottonseed oil is largely used in the U.S.A. for salad dressings; this also has to be chilled to remove the higher melting point fats and should withstand a temperature of 32° F. for five hours without clouding.

Corn oil or maize oil is particularly suitable where the product is liable to be exposed to extremely low temperatures. Corn oil does not congeal until the temperature falls to 15° F., which aids stability of the dressing. Corn oil also contains lecithin, which helps emulsification and is supposed to prevent rancidity.

A special mayonnaise mustard is sold from which a proportion of the fixed oil has been removed by cold pressing. The finely powdered mustard seed should be free from moulds and bacteria and have a fresh and pungent odour.

Vinegar Strengths and Flavours

There are many types of vinegar, and it is best to use a white vinegar of high acidity and good aroma. On the Continent cider or perry vinegars are used, but in the U.S.A. and in this country it is usual to use a spirit vinegar.

The strength of vinegars is often returned in grains, and recipes vary from 50 to 100 grains. Fifty grain vinegar is equivalent to 5 per cent. acetic acid, and 100 grain vinegar equals 10 per cent. acetic acid. Vinegars are also sold by numbers, which are approximately four times the strength of acetic acid; *e.g.* a No. 16 vinegar is equivalent to 4 per cent. acetic acid.

The vinegar is given a more interesting flavour by heating herbs and spices in it and keeping hot

for several hours before straining. Spices and herbs such as thyme, marjoram, celery seed, cinnamon, cloves, allspice, red and white pepper, mace, ginger, cardamum, bay leaves, coriander, turmeric, and garlic may be used. An average spiced vinegar is prepared by adding 2 oz. allspice, 2 oz. mace, and 2 oz. cinnamon to 1 gal. of vinegar of suitable strength. Some manufacturers use concentrated lemon juice to replace some of the vinegar in mayonnaises.

It is not generally realised that salt can be contaminated by bacteria, and therefore only the best quality should be used, as is also the case with sugar. White cane sugar of bacterial purity is used mainly in manufacture.

Frozen egg yolk is suitable for mayonnaise manufacture, and should be of good quality and odour.

Use of Stabilisers

In general, stabilisers are used only when the oil content is low, as in salad cream; those employed include starches, gelatine, agar, and gums. The starches most employed are corn starch and tapioca starch, and the favourite proportions are approximately 4 of corn starch to 1 of tapioca.

Formulae for Mayonnaises and Salad Dressings

Formulae vary from an oil content in the U.S.A. of 50 per cent. to 85 per cent. to a much lower value in this country.

THICK HIGH-GRADE MAYONNAISE

	Per Cent.	*Per Cent.*
Egg yolk	10	8
Oil	70	75
Salt	2	1
Mustard	1	1
Vinegar (6 per cent. acetic acid)	11	10
Sugar	3	1
Water	3	3
	100	100

SALAD CREAM OR DRESSING

	Per Cent.
Corn starch	2
Water	42
Oil	25
Mustard	5
Salt	2
Sugar	4
Vinegar	20
	100

There are many dressings on the market which are attractive in flavour and contain but little oil. Such dressings serve a useful purpose; though of lesser calorific value, they are more digestible and preferred by people who do not like products containing oil.

There is much scope for further development of products of less oil content, and manufacturers who undertake such work should be encouraged. Sauces of this type are particularly useful in conjunction with fish, increased consumption of which would be encouraged with an attractive ready-made sauce to hand.

Finally mention should be made of sandwich spreads and creamy salad "whips." These are both mayonnaise-type products, the former containing a fair amount of oil, the latter generally low in oil.

Manufacturing Procedures

These products lend themselves to various manufacturing procedures. Some dressings are prepared by high-speed beaters of the Hobart type; others are prepared in emulsifiers which depend for their action on the fine disintegration of oil globules into a disperse phase of water or acid. When the oil and egg content are high the egg yolk is a sufficiently strong emulsifier, and a stable product is formed. If the oil content is low, as in salad creams, a stabiliser must be added. Stabilisers vary in their properties, tragacanth exerting its greatest stabilising force at *p*H 2·5 while acacia is a better stabiliser at *p*H 5. Both these stabilisers tend to produce the oil-in-water type of emulsion as required for salad cream and mayonnaise. It is generally found that if an emulsion contains less than 25 per cent. of water or vinegar the emulsion is of the water-in-oil type, while more than 31 per cent. of water invariably gives an oil-in-water emulsion. The commercial salad creams and mayonnaises, especially in this country, are of the latter type, but the oil-in-water type dressing is more suitable for *hors d'oeuvre* and vegetable salad.

For continuous operation the dry ingredients, salt, sugar, and egg yolk, are thoroughly mixed with a small amount of vinegar. The mix becomes thick, oil is then whisked in, emulsification of the oil is very efficient, and finally the mix is diluted to volume with the remainder of the aqueous ingredients. This mayonnaise should be ready for bottling. If starch stabilisers are used, they must be gelatinised by boiling and cooled before use. If a colloid mill is available, a quick preliminary mix in a bowl is sufficient and the mix is then passed through the colloid mill to give a highly dispersed emulsion of oil in water.

Packaging Methods

In this country mayonnaises and salad dressings are invariably packed in glass bottles with a wide neck and metal screw cap. These caps are lacquered and stand up fairly well to the low acidity of the mayonnaise. Aluminium caps should be a

good alternative method of closure. In Switzerland and Germany a number of food products are packed in collapsible tubes, a convenient and hygienic package. It is not known how the British public would react to this type of package, but its usefulness for picnic lunches should make the collapsible tube package acceptable.

Finally it must be emphasised that the manufacture of salad dressing and mayonnaise requires careful supervision if a reliable product is to be obtained. As these dressings cannot be sterilised, the utmost care in the choice of materials must be exercised. The oil must be free from incipient rancidity and all the other ingredients pure and wholesome. Bottles should be sterilised by heat before use, the vinegar stock kept covered to prevent fruit fly depositing their eggs. It is advisable to heat and cool the vinegar in closed containers to prevent loss of acetic acid, and the emulsion procedure should be kept standard. With due care the manufacture and marketing of mayonnaises and salad dressings can be a satisfactory and lucrative business.

Estimation of Flour Qualities

ALTHOUGH indicating the quantity of gas likely to be produced under baking conditions, the maltose figure is not the only factor to be taken into consideration when assessing the value of a particular flour.

Questioning the use of good gas production if the gas produced could not be directed into the desired function of aerating the bread to yield a satisfactory loaf, Mr. Horace Ward, in a recent address to the Manchester Flour Milling Students' Society, said that the quality of the loaf depended to a large extent on the strength of the flour, which, in turn, depended on the second class of chemical compound contained in wheat, namely protein or gluten.

The strength of flour should be estimated by determining the protein or gluten present, extensibility, elasticity, stability, viscosity, and water absorption, which assessed the quality of the gluten, the gas production and maltose figure, and the ash content.

The quality of gluten, which is responsible for the strength of flour, is measured in terms of elasticity and extensibility, good elasticity indicating that the flour has the capacity of producing good volume in the loaf. A flour with better elasticity but lower protein content gives a dough of better handling properties, more balance, and larger loaves than the one with higher protein but lower elasticity.

Good extensibility is another important factor necessary for the production of a good loaf, though this by itself means little. The other qualities of the dough must also be good so that the gas produced during fermentation will expand the dough easily, giving a firm network of gas cells.

Stability is an important characteristic in flour quality, a dough lacking this quality tending to flow during proof and in the oven. Too high a stability cannot be corrected by altering the quantity of water present.

A dough which absorbed a lot of water during the mixing stage, due to starch damage, would start off as a firm dough, but would soften under fermentation, because it had no reserve to counter the softening process of enzymic activity as it broke down the starch structure. Initial high viscosity usually meant false water absorption, so that the baker was liable to give too much water to the dough, with the result that he might have too soft a dough when it came to moulding. On the other hand, a dough from a lightly milled sound flour had low or medium viscosity to start with, and would hold water throughout fermentation.

Thermal Processing of Canned Meats

WHILE admitting the hazards of drawing conclusions of commercial significance from laboratory studies, C. E. Gross, in his report on bacteriological studies relating to thermal processing of canned meats, claimed that these studies permitted the drawing of conclusions of some commercial importance. In his report, which was presented at the thirty-ninth annual meeting of the American Society of Animal Production, he stated that thermal resistance of putrefactive anaerobic spores in meat was studied, including a determination of thermal resistance for spores (1) formed in laboratory media; (2) formed in raw, pasteurised and sterilised meats; and (3) normally occurring in meat. It was found that curing agents in the amounts permitted for use in federally inspected plants did not affect the level of heat processes required for sterilisation, and that the thermal process for destruction varied directly with the concentration of spores.

Salt inhibited germination of spores surviving thermal processes, and was found quite effective at a level of 3·33 per cent. Spores surviving the thermal processes were shown to be viable two and one-half years later. The thermal resistance of spores is less when grown in raw meat or organs, and increases when grown either in pasteurised or sterilised meats and organs, with the average increase amounting to about three times. This effect was shown to be related to the substate itself, through repeated raising and lowering of resistance by transfer from media to media.

These data, he claimed, correlate with studies on the processing levels necessary for sterilisation of spores normally occurring in commercial meat and organs.

Turkey Steaks

TURKEY steaks were brought into being when the first deep-freeze plant was built by a farmers' co-operative holding company in Burgaw, Pender County, in North Carolina, after a successful county farm agents had sold the doctrine of poultry and pigs to cash crop farmers who were wealthy one season and slaves the next, dependent upon the vagaries of the weather and the North American markets.

The Pender County farmers make turkey steaks out of 40,000 surplus turkeys. If the market is right they sell, if not they leave the meat at about 10 degrees below zero in the big ice box.

Just after Christmas, 1946, James Ward and his partner, Mr. Wilkins, looked ruefully at some 40,000 turkey poults just learning the turkey strut around the barnyard, which in this case was some 200 acres of turkey pasture. Buyers had been scared off the turkey market by presumptuously high prices just as the holidays began, and other ranchers, usual outlet for Ward-Wilkins poults, had all the stock they wanted.

Above: The weight and combination of cuts may be chosen. Tar Heel steak folks are compiling a cookery book which they hope will make a turkey dinner possible all the year round.

Left: No drumsticks and no necks in turkey steaks. First operation at band-saw meat cutter is to trim spindling drumsticks, bony neck, and upper shoulders (small pile, extreme left), leaving almost uniform mass of equally divided white meat, dark meat, and gravy makings. Third of the way through, turkey steak in foreground is thighs (circles), ribs (left), chunks of back and sides (right), parts of liver and fat (right centre).

Below: Turkey steaks are individually wrapped in Cellophane, sealed, weighed, labelled, bundle-wrapped again in special freezer-locker paper, and are back in sub-zero temperature within fifteen minutes of leaving it.

Forty thousand turkeys, besides being a lot of turkeys, also eat an enormous amount of food. There is just one solution in all turkey economy to 40,000 turkeys: you either eat them or they eat you.

Messrs. Ward and Wilkins decided to turn the problem over to an expert, one Vivian Whitfield, State Legislator, expert in human relations and great lover of the ways of the farm. Whitfield called in another Tar Heel resident, Lewis Blake, manager-in-charge of the deep-freeze co-operative plant of which Whitfield is company President. Blake called in a Mr. Gravely of Swift's packing-marketing plant in Wilmington.

Several of the big birds of the flock were slaughtered, dressed, and packed within minutes into the quick-freeze storage room. After a couple of days they were brought forth and cut neatly, crosswise, into what looks exactly like planked steak, on a band saw meat cutter.

The great test was in the first eating. In the early spring turkey was being eaten in every conceivable form. The Wilmington plant put a hundred pounds on the market.

Net results at the moment is a huge pile of neatly wrapped turkeys weighing some 30,000 lb. stacked up awaiting the slicer.

Present directions are: Cook as any other steak. But cooking experiments have been going on; several new things have been learned about turkey meat.

The experiments see turkey steaks as both steak and turkey—something new under the sun and on the daily tables of Eastern America.

Skim Milk Powder in Bread

In Australia it is not customary to add skim milk powder to the common loaf of bread as it is in the United States. The only Australian breads containing milk powders are the fancy loaves for which the demand is limited. When skim milk powder is incorporated in the common Australian loaf there is an appreciable reduction in volume, the crust is harsh and immature, and the crumb coarse, open, and with frequent cores. This is contrary to the results obtained in America, where it is claimed that the addition of the powder to the bread improves every physical characteristic of the loaf.

To determine the reason for this detrimental effect and to ascertain whether it can be eliminated without any of the enhanced value of the bread being lost or the cost increased appreciably, investigation is being made on behalf of the Council for Scientific and Industrial Research by Dr. R. C. Hutchinson, Mr. H. E. West, and Miss Jeanette T. Jeffreys, whose work is reported in the Council's Journal for November, 1947.

The report points out that ordinary white bread is a poor source of several essential food constituents, of which skim milk powder is a particularly good source.

Although further problems are to be investigated, it has already been proved that by the addition of cane sugar and/or fat to the doughs containing skim milk powder, the resultant loaves are greatly improved, and that a loaf superior in all respects to the water-loaf control could be obtained by adding the fat in the form of an emulsion. Several fats, including lard, were tested. It was also concluded that satisfactory results could be obtained with a powder containing 20 per cent. fat, and that the most desirable amount of powder to add to the bread was 12½ per cent.

Seaweed Research

The history of the Association since its formation in June, 1944, is sketched in the annual report of the Scottish Seaweed Research Association for 1946.

The Director's report outlines the general programme of research and development recommended by the Technical Committee and approved by the Board of Management, which is as follows:

1. Survey of Scottish seaweed resources:
   - (*a*) Development of reliable survey methods.
   - (*b*) Quantitative survey of the Scottish coast for littoral, sub-littoral, and cast brown weeds.
   - (*c*) Study of economic and ecological factors.
   - (*d*) Determination of optimum conditions of weed growth by controlled culture.
2. Harvesting and processing investigations:
   - (*a*) Development of economic harvesting methods.
   - (*b*) Determination of optimum conditions of drying, grinding, and processing.
3. New and extended uses of seaweed and seaweed products:
   - (*a*) Determination of the chemical composition of Scottish seaweeds and its variation with change of species, season, age, environment, etc.
   - (*b*) Determination of the properties and characteristics of the chemical components of seaweeds and their derivatives, with a view to finding new and extended uses.
   - (*c*) Development of methods of production of such constituents and their derivatives as are of potential technical value.
   - (*d*) Determination of the value of seaweed as a component of animal feedingstuffs and as a fertiliser.

The report contains a littoral weed, sub-littoral weed, and rockweed survey of Scotland.

A study of the seasonal variation in composition of common brown algae, littoral weeds, and sub-littoral weeds is dealt with in the report of the Chemistry Division. The staff of the Engineering Division have been severely handicapped by the complete lack of facilities within the organisation for carrying out investigations and constructional work. Despite this progress has been made in the harvesting problems of littoral weeds and sub-littoral weeds and their processing.

Factory Organisation and Management

Experts on industrial administration have often given the impression that their principles and methods are rigid, which has tended to make the practical man fight shy of their advice. This review explains the elasticity of their systems.

IN a colonial food factory the output of work from a major and essential department was consistently disappointing. Several hundred women and girls, well paid and working under good modern conditions, never came near the management's expectations in their daily work of picking over or presorting currants and raisins. Expensive welfare and sports schemes were introduced; the workers seemed contented enough, but never reached what was believed to be a reasonable target per day or per week. The management could think of no further schemes or inducements and concluded that there was something about the nature of the work that precluded high output, and that nothing further could be done about it.

The Investigation is Initiated

In this "lost cause" spirit the directors unenthusiastically agreed to a firm of factory organisation consultants tackling the problem independently. The consultants were told from the outset that no suggestions would be accepted that incurred much outlay of capital or involved the installation of machinery; enough of the former had already been spent without effect, and the chances of the latter fitting into the conditions of the department were highly dubious. An investigator arrived at the factory. Every condition of work that he examined seemed satisfactory from the most enlightened standpoint—bench height, quality of lighting, seating comfort, supply or raw fruit, and removal of sorted material.

Time-study of Processes

The investigator decided to apply first principles and to time-study the process over a period. Throughout the second day this was done. On the third day the investigator presented his report and solution to the managing director! "How much will it cost?" demanded the managing director suspiciously. "Nothing," was the reply. No new process arrangements or new equipment or expensive systemisation were required—merely a concession to psychology.

The time-study had shown that the workers began their day with vigour and enthusiasm, but after about a couple of hours a mental defeatism set in and the rate of fruit-sorting declined seriously. The reason was that the "in-baskets" for the raw fruit were far too big, containing such a mass of waiting fruit that even the keenest worker could see little change for a few hours' maximum effort. In what in any case was monotonous work apathy set in early each day because, however well they started, the women could never actually see an appreciable reduction in the task they were set. All that was needed, the investigator claimed, was a substantial reduction in the unit amount of raw fruit supplied to each worker, and the suppliers to recharge the tray or basket whenever this amount had been handled. Dubiously the company made the change. The workers reacted as the investigator had expected, even competing with one another in the frequency with which they required fresh supplies. Instead of tiring quickly in a dull journey up an endless hill, they could measure their progress in simple milestone stages. Three months after the investigator's report the output of the department had risen by 87 per cent. and the factory's bottleneck had been dealt with.

Universal Application of Principles

This is but one of scores of practical examples in a new book* on industrial management by W. A. Melhuish. It is quoted here at some length as it may well be of significance to other food factories. As in so many books about factory organisation and process control, most of the author's examples come from the light engineering industry, but that must not dissuade members of other industries from studying this particular volume. Mr. Melhuish has taken great pains to show clearly that management methods are based upon general principles, and that these principles—if not the details of application in single cases—can be applied to all factories and departments. Of its kind this is easily the best book we have come across so far. Any director of any small or medium-sized business who could not profit from reading it is an administrator so efficient that he should be in charge of a much vaster business.

Practical Solution of Problems

Quite a few of the recent books and articles on management and industrial administration—and the number of these is increasing as rapidly as the

* *What's Wrong with your Factory, Office, or Works?* By W. A. Melhuish, M.S.E., M.Inst.B.E., A.M.I.P.E., M.Inst.W. London. Pp. 170. Price 15s. net.

subject is being recognised—have been written in an academic style; as books intended for the already converted these are no doubt invaluable, but they are of little help to the average business man. Mr. Melhuish has set out to be simple, direct and forceful, to express the problems of factory control and factory expansion, and their solutions in terms that any practical man can understand. Every point that he makes is illustrated with detailed case histories of factories in trouble and the curative treatments that were given.

Blunt Diagnosis and Reliable Cure

The ideal reader of this book is the director or manager of an old-established business who has already said to himself at this stage, "Yes, that kind of stuff is all very well, but it won't suit *our* conditions!" It might be said that the author has written his book almost entirely for this one manufacturer. Of him Mr. Melhuish writes: "This type, usually of the founder class, struggling with a business grown far beyond his control, remains adamant until evidence is given that his most feared competitors have thought fit to adopt the improvement themselves." Mr. Melhuish does not coat his pills with sugar nor does he offer quack medicine for industry; he is a plain doctor ready to offer blunt diagnosis and reliable cure or remedy to sensible patients.

Wise Management

His chapters on "The Managerial Sphere" and "The Personnel Factor" are first-rate. Separately published they would stand on their own feet as an outstanding contribution to industrial progress. The one drawback of the book is the universal drawback of all such efforts; it refers more often than not to factories of the engineering type. This does not mean that the discussion is mainly inapplicable to the food industry. Rather it means that, so far in the short history of management as a specialised subject and profession, it is only the engineering factories and shops that have widely accepted its influence. "If wise management be important anywhere," says the author, "it certainly is so in the small business." Books like Mr. Melhuish's will in ten or twenty years' time be able to quote many more case histories from small and medium firms of the food industry, but at present many food manufacturers may have not realised that men like Mr. Melhuish can help them.

Finally let it be said in further praise that this book does not deal overwhelmingly with war and immediately post-war conditions in industry. It could easily have backed the horse of "maximum output at all costs," but wisely the author has drawn upon a long-term experience of business conditions, of business in a seller's market and in a buyer's, of slump as well as of boom. Manufacturing costs count as much as output curves in his analyses.—D. P. H.

Food Anticipations

WHILE we shall apparently have the potato acreage we need for our relief from rationing, there can be no doubt that farming in this country will have to face a growing labour crisis. We may expect to get safely through the next harvest, but the real crisis cannot be indefinitely postponed. This is not the place to discuss farming problems in any detail. Yet it must be noted that the power of the average farmer to mechanise his production processes, and to reorganise his labour force more efficiently, is probably far lower than is the power of the average industrialist. The effective organisation of farm labour is not always as simple as it sounds; and on the other hand, many farmers are still in the mood of believing that most of their difficulties can be met by higher mechanisation.

It is necessary at this dead season of anticipation to draw attention to these remoter problems, because we are going to hear increasingly about them as the year draws on. Meantime, the statisticians are for the moment passing through a period of cautious optimism. The prospects for the European harvest are reasonably good; and it is becoming clear that we need a good European harvest to break American farm prices and force the U.S. Government to take new measures for the conservation and development of American farming. At present they have too small an incentive to do so. The recent droughts have recalled many Americans to the sanity of the late 'thirties, when the soil conservation committees were flourishing and when T.V.A. was giving evidence of what could be done by reasoned co-operation between authorities and producers. Now U.S. Agricultural Secretary Anderson warns that the soils may not be able to stand the growing of large grain surpluses for export, and he proposes in the present crop year a carry-over figure of about 4 million tons of wheat.

Before July the figure may have been raised, and it is upon the projected carry-over stock that the proportion of U.S. wheat diverted to relief purposes will depend. At the moment it looks as though the proportion may reach about 11 million tons, and that is a slight fall from earlier estimates. To balance this the Argentine wheat harvest is almost certainly better than had been expected a month or two back. The exportable surplus will probably reach 4 million tons, and this is at least double the earlier estimates.

Another basis of European optimism has been the measure of recovery in the Far East, even if on inspection that recovery turns out to be less good than had been believed. It is at present anticipated that surplus rice from the main exporting countries will, in 1948, reach 3 million tons or more, as compared with 2 to 2½ million tons last year.

(*Concluded on page* 126)

Herring Canning in Germany

HERRING canneries investigated in Germany were not found to be mechanised to any great extent, most of the work being done by hand. In some places belt conveyors and fully automatic closing machines were used, but these were by no means general.

Preparation of Round Fish

The round herring were washed and scaled and then fed into a machine which removes the head, bones, and entrails, and by adjustment can be made to separate the herring into two fillets. A conveyor along one side supplies the machine with round fish while the fillets are carried away by water flume, no further washing being required.

The first step in the canning process after the fish are cleaned is brining. Usually done by hand in wooden tubs or brick vats, brining gives the finished fillets a slightly salty flavour. They are brined about fifteen minutes in 8 per cent. sodium chloride solution.

After brining, two methods were used for pre-treating the fillets: (1) Cooking in steam or water and (2) drying and hot smoking.

Cooking with Water

For cooking with water an arrangement whereby the fillets on trays were passed through a metal or glazed brick-lined tank for a period lasting from three to six minutes was in use.

Two designs of machine for doing this were seen. In one type the fillets on trays were placed on metal carriers which ran on an ovoid mono-rail track. At one side the track dipped steeply so as to immerse the trays in a tank of hot water situated underneath. They then travelled by their own momentum to the other end, where the track returned to its former level. A rotating arm then elevated each carrier from the boiling tank to the higher part of the rail where the trays of cooked fish were removed and others bearing fresh fish substituted.

The other type consisted of two parallel chain and sprocket devices and chains bearing triangular frames and wheels at intervals. These frames were designed to carry trays of fish. As the conveyor slowly rotated trays of fish were placed on each frame and carried down under the surface of the hot water, the elevation being controlled by the small wheels on the apices of each frame which ran along ledges on either side of the tank. On leaving the tank at the other end the trays are removed. These contrivances are also used for frying herring in oil.

Steam Cooking

Cooking with steam instead of boiling was said by some operators to be preferable. The reason given was that more of the flavour was retained by the steaming process. An ordinary steam chest was used for this purpose, the fish being laid on perforated aluminium trays which were stacked on small dollies. The loaded dollies were placed in the steam box and live steam passed through for ten minutes. The steam was then turned off and the dollies withdrawn.

When the trays had cooled sufficiently to permit handling they were emptied on to the packing tables and the fillets packed into the cans.

In some cans an additional drying treatment was given to the fillets after they had been steamed. The loaded trays were passed through a tunnel about 40 ft. in length by means of chains and sprockets. It took from fifteen to twenty minutes for the trays to pass through the tunnel, during which time they were subjected to a temperature of 60° C. Heat was generated in a small firebox situated underneath at the inlet end, the moist air being drawn off through a chimney at the top of the outlet end. In addition to the drying, which was said to be necessary to obtain a satisfactory texture, this process added a slight smoke flavour to the fish.

Drying and Hot Smoking Fillets

Four of the plants visited had similar equipment for carrying out the drying and hot smoking of fillets. Kilns were cylindrical in shape. The split or filleted fish were spread on perforated aluminium trays which were loaded on to carriers, two trays to each carrier. The trays were 36 × 39 in. One side of each carrier was attached to an endless metal belt, while the other side had two small casters which ran on a guide rail parallel to the belt. They entered the kiln from the top, being carried up at an angle from loading level, and on entering the chain was wound on to a revolving drum. Thus the trays of fish passed down through the kiln spirally until they reached the bottom, when they left the kiln and were conveyed back to the loading area. Here finished fish were unloaded and new fish substituted. The endless metal chain now passed round a circular track exactly equal in diameter to the central drum and thence back up into the kiln. In one of these driers examined, the track supporting the outer edge of the carriers was continued throughout the kiln, but in others it was discontinued at the entrance. It was

B.I.O.S. Final Report No. 1071. *Certain Aspects of the German Herring Canning Industry*. E. P. Sidaway, Department of Scientific and Industrial Research. (H.M. Stationery Office, price 2s. net.)

claimed that this modification lessened the possibility of jamming within the kiln.

Within the kiln heat was supplied by sets of finned steam coils installed vertically around the outside of the path of the trays, while three turbo fans on a central shaft circulated the air over the fish and through these heaters. Air was exhausted through a stack in the top of the kiln and renewed at the bottom, and the relative humidity could be controlled by manipulation of the exhaust damper. A small amount of smoke was introduced through ports placed on one side of the lower part of the kiln from fire boxes located externally. The heaters did not extend lower than about 6 feet above the floor, the lower portion of the kiln being used for cooling the fillets.

Sauce Fillings

A great variety of sauces was used with the boiled or steamed herring. For these sauces homogenisers of the centrifugal type running at high speed were generally used which produced a stable emulsion.

The sauces most frequently used were prepared from mustard or tomato paste with various ingredients added. White sauces were made from milk, flour, oil, water, and vinegar, with the addition of some stabiliser usually referred to as egg substitute. This latter was a variable commodity, being made either from blood (serum), fish, or milk protein. Vegetable oil and vinegar were apparently incorporated in all sauces.

In filling the cans, half the sauce was placed in the empty can, the fish packed on top, and the other half of the sauce poured over it. The finished cans contained 215 g. of fish and 100 g. of sauce.

Processing Methods

At one time during the war use had been made of lacquered aluminium cans for oily, non-acid, or mildly acid packs. At the time of this investigation only lacquered black iron or tinplate cans were being used. Aluminium cans and those made of extra thin plate required special care in pressure cooling, and for this purpose several of the factories had installed special retorts.

The retort itself holds about 6,000 cans, and immediately above it and connected with it is an insulated tank of 2,000 litres capacity. The canned fish is cooked in water which is heated by live steam injected through sparge pipes in the usual way. When cooking is finished the valve connecting the retort with the upper tank is opened and cold water introduced at the bottom. The hot water is forced into the upper tank, maintaining the pressure on the cans as they are cooled. The valve connecting the two tanks is then closed and the cooling water drained off. When the next batch of cans is introduced the water in the upper tank, stil hot, is drained down into the retort proper and the process repeated. This type of retort was said to be particularly successful. Temperature and pressures in the retort proper are recorded on charts conveniently located above the valves.

In addition to this type there were the usual horizontal retorts and also a number of small vertical retorts holding anything from 500 to 800 cans.

The processing temperature in general use was 112° C. The processing time, however, varied, some cooking for sixty minutes and some for seventy minutes at 112° C.

Food Anticipations

(*Concluded from page 124*)

This still leaves us in the current year with little more than a third of the pre-war average rice exports. But it is a symptom of recovery. To balance this, again, we have news of decreasing levels of rice production in Brazil. Thus European hopes are founded mainly on the prospect that her own harvests will be sufficient to lower American prices, and that Australian, Argentine, and Soviet wheat surpluses will continue high enough and cheap enough to stop up the inevitable gaps in the Continental wheat front; they are founded further on the devout trust that no desperate fissure will appear in the Asiatic grain supply.

On the latter problem the FAO conference held in the Philippines early this month, will be critical. It is reviewing rice production questions and fisheries in the Far East, and it may in its effect be the most significant of all the FAO conferences yet held. For from it we shall get some indication of the moods and the policies of the new governments of the East. They have large and growing populations, and these populations have been notoriously underfed for centuries. To what extent will they, or can they, for the time being devote their energies to the tasks of agrarian reform? To what extent will their nationalism tend to persuade them to retain a very large proportion of their products for their own consumption and that of their neighbours?

In short, how much rice, sugar, vegetable oil, soya flour, and other products can Europe expect to receive from the Far East over the next ten or twenty years? It is on this vital point that the outcome of the Philippines conference may throw some light.

So we return again to our own levels of production and to our own labour problem on the farms. In face of the long-term world prospects, it will be as well for us to solve this problem as realistically as we may. For on its solution will depend our ability to secure from our own soil the types and quantities of food we shall require.

The Quality of Proteins

D. P. CUTHBERTSON, D.Sc., M.D.
Rowett Research Institute, Bucksburn.

THE pioneer experiments of Willcock and Hopkins, and Osborne and Mendel, were brought to a new stage by Rose, who determined the amino-acids indispensable for the growth of the rat. Rose defined an indispensable dietary component as "one which cannot be synthesised by the animal organism, out of the materials ordinarily available, at a speed commensurate with the demands for normal growth." Almquist, Jackson, Albanese, Holt, Mitchell, and collaborators have added to our knowledge by studies on animals, including man. Of the ten amino-acids found essential for the normal growth of the rat and the dog by Rose (1938) and Rose and Rice (1939), all, with the exception of histidine, appear to be essential for full functional maintenance in man (Rose, Haines, and Johnson, 1942; Rose, Haines, Johnson, and Warner, 1943; Albanese, Holt, Frankston, Kajdi, Brumback, and Wangerin, 1943). The transamination shuttle mechanism described by Braunstein and Kritzman and the transmethylation mechanism by Du Vigneaud, Chandler, Cohn, and Brown (1940), have revealed the internal transmutations which render many of the known amino-acids dispensable in the diet.

The tissue protein synthesised must be assumed to be of a type normal and characteristic of the species. The work of Lee and Lewis (1934) and of Louis and Lewis (1944) indicates that composition of tissue proteins is apparently not altered by inanition and hepatoxic agents, contrary to the observations of Schenk and Wollschitt (1933) and Roche (1934), which indicate a change in the composition of tissue protein by preferential loss of one or more proteins, or by a partial and progressive dislocation of existing proteins. This aspect was recently reviewed by Kosterlitz and Campbell (1945).

Differentiation between Proteins

Determination of "biological value" of protein has been reviewed by Boas-Fixsen (1934-1935), and quality of proteins by Cuthbertson (1940, 1944). During the first world war and after, it became customary to divide proteins into first-class proteins, *i.e.* the edible proteins of animal origin, and second-class proteins, *i.e.* of vegetable origin. Though based on a few incomplete analyses of pure proteins, this division was useful in drawing attention to the differences in amino-acid composition. The results of Corry Mann's observations on himself (1935) suggest marked differences in biological value as between such first-class proteins as those of meat and of milk, and point to the superior nutritional value of milk proteins. Credit for pointing out the supplemental action of the proteins in the diet as a whole rests mainly with Mitchell (1937); the theme was considerably expanded by Terroine (1936). The "milk for schools" scheme, which has shown the practical value of protein supplementation, is mainly due to the work and drive of Sir John Orr and his colleagues. As examples of protein supplementation, the experiments of Jones (1944) may be quoted. He showed that although arachin, the chief protein of the peanut, is deficient in methionine and tryptophane, yet a mixture with conarachin in proportions as the proteins occur in the nut will enable young animals to grow at a satisfactory rate, and those of Chick and Slack (1945), whose observations have shown that even gelatin may improve a diet in which the sole source of nitrogen is the proteins of wheat flour. When animal proteins are short, dietary proteins may be economically supplemented by soya bean, peanuts, and cotton seed.

In the light of these and other observations, the terms first- and second-class proteins as applied to the mixed proteins of animal and vegetable tissues become meaningless and should be discarded.

Assessing Quality of Proteins

Information is accumulating and methods are improving slowly but steadily. At the moment we have to be content with:

(*a*) determinations of a few but steadily increasing number of amino-acids with the highest possible accuracy, and

(*b*) the "biological value" method for broad surveys of the field of nutritionally valuable food proteins.

Single food proteins may be good sources of those amino-acids most commonly estimated and yet lack one or more of the other essentials for which analytical methods are more difficult and often less accurate. Block and Bolling (1945) have pointed out that since the amino-acid methods generally require hydrolysis of the protein before analysis, it is very necessary to determine the susceptibility of each amino-acid to loss during hydrolysis. This loss differs not only for each amino-acid but also with the conditions of hydrolysis, and even more so with the presence or absence of other substances, *e.g.* cystine, and especially cysteine, which may be destroyed during acid hydrolysis when carbohydrates are present, but not in their absence. Of the chemical methods available, the isotopic dilution method (Ussing, 1939; Rittenberg and Foster, 1940) is the best. The new

Abstract of the introductory paper read in the symposium on The Quality of Proteins at the Fourteenth Scientific Meeting of the Scottish Group of the Nutrition Society.

microbiological methods are promising, but require further careful study.

In the absence of complete analysis, it is still customary to assess relative biological value of proteins by animal experiment. For example, Dr. Chick (1942) has shown that the slightly greater digestibility of white flour is more than compensated for by the greater biological value of 85 per cent. extraction, or of national wheatmeal flour, in promoting growth in young rats.

Everson and Heckert (1944) have demonstrated that the growth-promoting qualities of legumes vary with the source, degree of maturity, and method of cooking, and that all the mature legumes, except peas, have a higher biological value after heating.

The detrimental effects of severe heat in processing wheat and oat cereals, noted by Morgan in 1931, have been recently confirmed by Murlin, Nasset, and Marsh (1938), and Stewart, Hensley, and Peters (1943).

Intravenous Feeding of Amino-Acids

Since Henriques and Andersen's experiments with goats in 1913, numerous experiments on man and lower animals have demonstrated that intravenous feeding with amino-acids can be maintained for as long as forty days. The technique has obvious possibilities in studying the amino-acid requirements where the ability to ingest, digest, or absorb protein is defective. There is still no entirely satisfactory method of covering the amino-acid and energy requirements by intravenous feeding as the volumes of the dilute solutions required are so enormous.

Amino-Acid Composition in Relation to Plasma Protein Formation and Organ Function

A mixture of the ten purified amino-acids essential for maximum growth in the rat (Rose, 1938) was found by Madden, Carter, Kattus, Miller, and Whipple (1943) to be as effective by mouth as most native proteins for the production of plasma proteins in standard plasmapherised dogs.

Glycine was generally present to about 25 per cent. of the mixture. Omission of glycine, although a positive N balance was maintained and plasma protein synthesis was satisfactory, resulted in a small loss of bodyweight. Attempts to compensate for the glycine by increasing proportions of several essential amino-acids did not improve the general utilisation.

Removal of arginine induced a slow fall in plasma protein production. Simultaneous omission for one week of arginine, histidine, and most of the lysine caused a marked drop in plasma protein production, although bodyweight and N balance were maintained.

Replacement of methionine by cystine appeared to have no effect on plasma protein production, but led to a loss of bodyweight and negative N balance.

Removal of valine or threonine led to a sharp fall in plasma protein production, and to a negative N balance.

These replacement experiments demonstrate the fallacy of placing too much reliance on bodyweight and N balance data alone.

The source, production, and utilisation of the plasma proteins were reviewed by Whipple (1942) and Cuthbertson (1944). The work of Whipple and collaborators seems to show that animal protein is twice as effective as vegetable protein in combating oedema and hypoproteinaemia. Certain plant proteins, *e.g.* rice and potato, appear to favour a low albumin:globulin ratio, since they favour the production of globulin.

Quality of Proteins in Liver and Kidney Dysfunction

Hock and Fink (1943), in experiments on young rats receiving a basic diet containing 1·64 per cent. cereal protein, found that the addition of fishmeal or skimmed milk powder as a protein supplement gave good growth, but that the addition of brewer's yeast or wood sugar yeast gave growth only half as good. On adding 0·2 per cent. cystine, however, to the yeast supplement groups, growth was again as good as with the animal protein supplements.

The livers of the rats receiving the yeast supplements had a mottled appearance, were much enlarged, and showed fatty degeneration, with occasional necrosis. The kidneys showed degenerative changes and signs of glomerulonephritis.

Himsworth and Glynn (1944, 1945) have shown that the development of massive hepatic necrosis is dependent on the quality and quantity of dietary protein intake. Casein in small amounts prevents the lesion. Yeast protein, if the sole source, is ineffective even in large amounts. Casein is relatively rich in methionine while yeast protein is poor. Adequate amounts of methionine, additional to the yeast protein, give effective protection. These results suggest that in cases of hepatitis, due to poisons or viruses, the development of the complication, massive hepatic necrosis, might be prevented by a high protein diet or methionine.

Amino-Acids of Human Milk

Williamson (1944) found that, apart from tryptophan and methionine, the ratios of the amino-acids in cow's milk compared with human milk are roughly 2:1 in favour of cow's milk. For tryptophan, the ratio is 1·5:1. The S-amino-acids as a group conform to the general ratio.

Farm Mammals

Protein deficiency is usually manifested by a reduction in growth, fattening, milk production, or quantity and quality of hair. It is said that swine are most likely to suffer from a deficiency of pro-

tein unless skimmed milk is available or in regions where peanuts are grown.

In ruminants, the problem of amino-acids requirement is complicated by synthesis of protein in the paunch (Harris and Mitchell, 1941; Goss, 1943). Pearson and Smith (1943) showed that the biological value of a protein may depend on whether its presence in the paunch promotes protein synthesis or hydrolysis. Fowler, Morris, and Wright (1934) have shown the beneficial effect on milk production of protein concentrates rich in lysine.

Resistance to Disease

Evidence is fairly conclusive that an antibody is a molecule of globulin, which, during synthesis, has been specially modified under the influence of antigen. Madden and Whipple (1940) demonstrated that the production of normal serum globulin depends on the utilisation of an adequate assortment of amino-acids.

Cannon, Wisler, Woolridge, and Benditt (1944) have shown that protein depleted rats have a decreased capacity to fabricate antibody, and a definitely increased tendency to develop spontaneous infections. These changes are accompanied by hypo-albuminaemia and hypoglobulinaemia. With high-quality protein diet, these rats quickly regenerate immune globulin.

These observations are of great importance in surgery, particularly when the body proteins have been depleted through haemorrhage or exudation.

Rats on a diet containing casein had a higher resistance to *S. enteriditis* infection than controls fed on vegetable protein (Robertson and Doyle, 1936).

Antibody formation is but one reaction to infection. The study of tissue reactions, as a whole, to infection and disease is one of the most fruitful fields for investigation.

The Effect of Trauma

As the result of physical trauma it appears a phase of vigorous protein catabolism sets in (Cuthbertson, 1942). Particularly in the case of burns, the need for sulphur-containing amino-acids may dominate the process. The observation by Croft and Peters (1945) that the addition of methionine to the diet of the rat can largely eliminate this catabolic loss of tissue protein is most interesting, but awaits clinical confirmation.*

The processes of protein catabolism and anabolism and of deamination and reamination, which occur during the intermediate phases of amino-acid metabolism, are, however, of such an order that the healing process is, to a considerable extent, independent of the quality and quantity of the protein in the diet.

Vaughan, Dent, and Pitt-Rivers (1945), who worked in Belsen concentration camp following its liberation, found that skimmed milk was the best vehicle for administering protein to starving subjects. Occasionally it might be necessary to give intact protein by vein. The unpalatability of protein hydrolysates was a barrier to their acceptance, even by starving subjects.

Determination of Protein Quality

To conclude, the quality of the protein of the diet is determined by its amino-acid composition and its general physico-chemical characteristics. The requirements of the organism for the amino-acids which it cannot synthesise, or at a rate too slow to meet the local and general requirements of the moment, as well as its needs for certain of its enzymes, hormones, non-protein constituents, and metabolites vary considerably. Moreover, it is also necessary to supply sufficient nitrogen, sulphur, and specific groupings to meet the local and general anabolic requirements of the body.

It should be our ultimate aim to determine the amino-acid requirements of the organism:

1. During growth, maintenance, and eutrophy.
2. During pregnancy and lactation in mammals.
3. Following trauma and during wound healing.
4. In relation to resistance to, and recovery from, infection.
5. Following exposure to toxic substances of endogenous or exogenous origin.
6. In conditional deficiencies.
7. In departures from normal hormonal activity.
8. In the bird.
9. In the ruminant.
10. For wool and hide production.

* More recent observations by Peters and his colleagues have not confirmed their original findings (Gribble, Peters, and Wakelin, 1947).

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(*Concluded on page* 131)

Scottish Research Institutions

BORN to meet urgent practical needs, nurtured alike by the fruit of individual enterprise and local co-operation, growing sometimes literally out of the land of Scotland, they have gained international reputation and drawn workers from many lands. This is the description given by the author of a small book* of 56 pages giving a general picture of Scottish Research Institutions, written in an attractive style. Dr. Wightman describes seven research institutions. With the space at his disposal, it was quite impossible to describe the latest scientific discoveries that have come from their laboratories, but he gives a general picture of what the institutions mean to the Scottish people, not only for their contribution to better living, but also to scientific culture.

Rowett Research Institute

Of the Rowett Research Institute in Animal Nutrition the author points out that it is a nerve centre for the promotion of active research on nutrition throughout the Empire. its services being recognised by the Empire Governments in the form of direct grants to the bureau. But it is more than a nerve centre; it is the "home" of Empire workers. It is interesting to learn that the Institute started with a staff of one, no less a person than Sir John Boyd Orr. The principal benefactor was Mr. John Quiller Rowett. By September, 1922, progress had been sufficient to permit of a formal opening.

The objects of the institute were stated as follows: "Investigations into the energy and material requirements of farm animals, under conditions of maintenance and various kinds of production, and the best means of meeting these requirements; and, on the other hand, investigations into the constituents of, and the digestibility and nutritive value of, the various feedingstuffs." It is of special interest to read how much is owed to the Rowett Institute and its director in respect of the astonishingly high level of nutrition we have enjoyed during the war.

Macaulay Institute for Soil Research

A demonstration farm was established in Lewis in 1929. Within three years "a very desolate tract of deep and wet peat land has been converted into a farm; an outstanding success has been the establishment of excellent pasture on which cows have been grazed for the past two summers." (W. G. Ogg, *Scottish Journal of Agriculture*, Vol. 15, No. 1.) But Lewis is not the only part of Scotland with poor soil. So Mr. Macaulay decided to form a national centre for soil research in Scotland.

In 1930 a mansion house within two miles of the centre of Aberdeen was equipped and work on soil initiated. Even in the abnormally long winters of 1940 and 1941 advisory work was well maintained and in one year 3,600 samples were examined. Since then the number has been increased.

As an example of the work carried out at the institute was the discovery that a complete failure of beet crops was attributable to deficiencies of boron in the soil. Another example was work with cobalt which was carried on in collaboration with the Institute of Animal Diseases Research Association. A dressing of cobalt sulphate so improved pastures in various parts of Scotland that sheep "pining" was controlled. Planned experiments started some years ago to determine the comparative value of simple compost, artificials alone, and the combination of both, and are still being carried on.

Animal Diseases Research Association

The Moredun Institute of Animal Diseases Research Association is situated at Gilmerton on the outskirts of Edinburgh and was officially opened in 1927. Its work has proved of incalculable value to agriculture. The establishment of the Moredun Institute truly represented a pioneer effort of its kind.

Examples of the results of research work carried on are: the determination of the cause of the serious disease of sheep known as "braxy" and the evolving of a specific vaccine for its prevention, which has reduced the incidence of the disease to a negligible figure. Other scourges of animals studied are "louping-ill," lamb dysentery, and milk fever in cows. The saving effected by the Moredun Institute in the scientific cure and prevention of diseases in animals has been assessed at considerably over £100,000 every year.

Institute of Animal Genetics

The Institute of Animal Genetics, situated on the outskirts of Edinburgh, is both a Research Association and a Department of the University. Among many activities, the institute maintains a herd of cows and pigs for devising ways of turning genetical theory to the advantage of the breeder. Both the cows and the pigs are the starting-point for studies for estimating the breeding value and of the ways by which the country stocks can be improved by the most effective use of élite strains. During recent years the most important work carried out at the institute has been research into the genetical basis of egg laying in domestic poultry. Another branch of genetics concerns studies of the banana fly. Their value to the geneticist lies in their remarkable fertility, from

* *Science in Scotland*. By W. P. D. Wightman, M.Sc., Ph.D., F.R.S.E. Pp. 56. London. 2s.

egg to egg in about a fortnight and dozens of offspring at a "sitting"; more fundamental discoveries have been made in a year with the fly *Drosophila* than could have been learned in a century of study of poultry. So both sides of genetical research flourish at the Institute of Animal Genetics.

In February, 1947, the transferring of the genetics laboratory of the National Animal Breeding Research Organisation was announced. It will work beside the institute under the latter's director Dr. C. H. Waddington.

The Hannah Dairy Research Institute

In 1929 the Hannah Dairy Research Institute was a going concern and the first annual report was issued in 1930. From its inception the Hannah Institute set itself the problem of reducing production costs by research on inheritance of high milk yield, increasing the milk life of cows, reducing the cost of feed by replacing imported cake by silage, dried grass, etc., improving the prospects of disposing of surplus milk by investigation of "spray-drying," the product of wh.ch is "household milk." A promising start has been made in the effort to clean out the stain of bovine tuberculosis by a survey of dairy herds throughout the country with a view to discovering and weeding out the "reactors." The task before the workers is that of ensuring an increased supply of milk at a price within the reach of all having the care of young children and of such quality as will enable the costly process of pasteurisation to be dispensed with.

Scottish Society for Research in Plant Breeding

The Scottish Society for Research in Plant Breeding, with its headquarters at Corstorphine, Edinburgh, was founded in 1921. Its avowed aim was the establishment of "a thoroughly equipped station and the promotion of the discovery and the creation of such new and improved races of the leading crop plants as are best suited to Scottish conditions." The methods employed are: (*a*) collection and classification of suitable living material, (*b*) isolation of "pure lines" and special purpose strains or varieties, (*c*) hybridisation of "pure lines," varieties, and species, (*d*) comparative trials. An interesting scheme of research comprises experiments to obtain hybrids by crossing the best commercial potato varieties with wild Mexican species possessing immunity from "blight."

The Torry Research Station

The Torry Research Station is part of a Department of State, and its function is mainly the problem of preservation of fish and the elaboration of by-products. Such matters as the effect of freezing, changes of texture, dehydration, the smoking of herring are dealt with, and it is to the station that we look to point the way back to the prosperous fishing industry of former days.

The Quality of Proteins

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News from the Industry

Research in 1947

Included in the work of the BTH Research Laboratory in 1947 is the development of a betatron with an output of 10 to 15 Mev., new alloys for glass to metal seals, and the development of synthetic mica. Improvements have been made in the "warm-white" fluorescent lamp resulting in the luminous output of the 80 watt lamp being increased from 2,800 to 3,600 lumens. Among the new apparatus developed during the year is an instrument for calculating the polar distribution of any given light source and optical system.

Bakery Cream

A cream suitable for application in the baking industry and containing 25 per cent. vegetable fat, 65 per cent. pure sugar, 5 per cent. glucose, and 5 per cent. moisture is being marketed by the New Era Co. at a controlled price of 2s. per lb. This has been approved of for sale to the bakery and general trade for the manufacture of confectionery, its great asset being the fat content together with the pure cane sugar both of which are in short supply.

Lactose powder with a guaranteed purity of over 99 per cent. is also being imported by this firm.

Another Factory for Scotland

To save dollars for this country, Remington-Rand, Ltd., manufacturers of electric razors, typewriters, and steel office equipment are bringing an entire manufacturing plant across the Atlantic to Glasgow.

The new factory will be established at Hillingdon, Glasgow, and will give employment to upwards of 1,000 workers. Goods will not merely be assembled, but will be actually made at the plant. Production is expected to be well advanced within three months, and will mean increased supplies, not only for the home market, but will also materially assist the export drive.

X-Rays in the Food Industry

THEIR USE IN INSPECTION TESTS

As an inspection medium in the food industry, X-rays are being used to an increasing extent since manufacturers who market foods in packaged form are becoming more conscious of the need to carry out inspection tests during processing and often after sealing to detect any impurities that may be present. To meet this demand, Philips Electrical, Ltd., have designed and developed a flexible type of X-ray unit, the Macro 100, capable of tackling a wide range of food inspection problems.

The apparatus is divided into three main parts, a shockproof and rayproof X-ray tube, H.T. transformer, and a control table of the portable desk type.

For the usual method of inspection, the X-ray tube is positioned below a bench or conveyor and the objects for examination are passed over the X-ray beam, the resultant image on the fluorescent screen being reflected by a mirror set obliquely to suit the comfort and convenience of the operator. By means of a simple trigger mechanism attached to the bench in front of the conveyor, faulty articles can be rejected. In this way, a large number of items can be examined per hour.

Lactates in the Food Industry

By virtue of its pleasant, mild and refreshing taste, its preservative action against bacterial action and its nutritional value, lactic acid is a useful product in the preparation of many foodstuffs. Edible salts of the acid, and also compounds with starch and sugars, have special uses.

Lactic acid assists the enzymatic breakdown of starch and protein in baking processes, where it is also of value as a yeast nutrient and in resisting undesirable bacterial and mould growth, and in the form of its salts or solid compounds is an acid component of baking powders.

In brewing, the beneficial effects of the acid as an enzyme assistant to improve flavour, and for many other purposes, is well known. As a preservative, the acid finds application, among other products, in fish, meat, and pectin, and is an acidulating agent for pickles and sauces, while in dilute solution it is an excellent acidulant for soft drinks.

The acid and its calcium salt are used in infant foods, in which it exercises a corrective effect on the digestive tract and improves the digestibility of the casein.

Many other applications are given in detail in the booklet "Lactates," issued by the manufacturers, Howards and Sons, Ltd., who also produce technical ether and the "Avantine" brand of isopropyl alcohol.

Tomato Growers' Protest

The help of the Scottish Fuel Efficiency Committee has been enlisted by Lanarkshire tomato growers in a protest against threatened heavy cuts in their coal allocations, and the committee have urged the Government to grant adequate fuel to this essential industry. The new allocation of 225 tons per acre of glass is regarded as useless by growers, necessary consumption being in the region of 310 to 440 tons per acre.

Light Metals Research

Formed in the belief that the light metals have a greater role to play in all industrial fields, Almin, Ltd. (Associated Light Metal Industries), embraces the whole span of light metals technology and maintains a central advisory bureau to co-ordinate and advise on the activities of the several companies. Acting as a central source of information to outside organisations, the bureau sends its own technical experts overseas to assist in the setting up of plants, and undertakes to receive technicians for comprehensive training.

Appreciating the disadvantages of the establishment of a research department as a part of the organisation, Almin, Ltd., inaugurated the Fulmer Research Institute as an independent, non-profit-making research centre to carry out a continuous programme of long-range research in the metallurgical and allied fields, its services being available to the industry at large.

Appointments and Resignations

Mr. L. S. Forster, who joined the Creamery Package Manufacturing Co., Ltd., as director and manager in 1945, has now been appointed managing director.

▪

After 44 years' service, Mr. R. E. Brettell has retired from his position as a general manager of Southall and Smith, Ltd., and has been succeeded by Mr. J. R. Kirk.

▪

Mr. R. M. Gillies, the London manager of G. and J. Weir, Ltd., retired on December 31, 1947, after 29 years in this capacity, and Mr. Andrew C. Smith has been appointed as his successor. Mr. Smith has been 17 years in the firm's employ, having served his apprenticeship with them, and he has had considerable experience in all branches of the firm's activities both at home and abroad.

▪

The Richard Crittall Group announce that Mr. A. E. Hinds, joint managing director, has been appointed managing director and Mr. J. L. Musgrave is retiring from the joint managing directorship, but will continue to serve as chairman.

To assist the managing director in the general administration of the Group Mr. C. J. Hyde-Trutch and Mr. W. A. McPhail have been appointed joint assistant managing directors.

Mr. R. G. B. Crittall has been appointed general manager in control of the Southern Area and Mr. J. P. Hamill as general manager in control of the Northern Area.

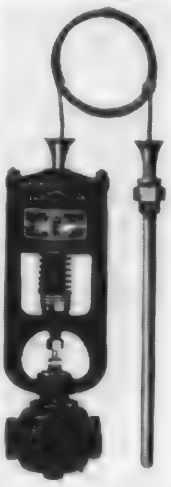
New appointments made in the directorate of the Parent Company include: Mr. V. C. Hardy as director in charge of exports, Mr. G. F. Wattears as sales director, Southern Area, Mr. W. R. Cox as director and chief design engineer, Mr. F. Carter as director in charge of outside contacts, Southern Area, and Mr. H. O. S. Bridcutt as director, also as senior vice-president and general manager of Richard Crittall Radiant Heating Inc., New York.

A number of new executive appointments have also been made in connexion with the Parent Company and also the following subsidiary companies: Air Ducts, Ltd., Channel Conduits, Ltd., Crittall Kitchen Equipment Co., Ltd., Dulrae Manufacturing Co., Ltd., Dulrae Patents, Ltd., Grierson, Ltd., Magnetic Valve Co., Richard Crittall (Industrial Plant and Equipment), Ltd., Heather Filters, Ltd., Richard Crittall Research and Development, Ltd., Richard Crittall Mechanisations, Ltd.

▪

The Governing Council of The British Engineers' Association have elected Mr. C. K. F. Hague, M.I.Mech.E., as President of the B.E.A.

Self-Operating Regulator

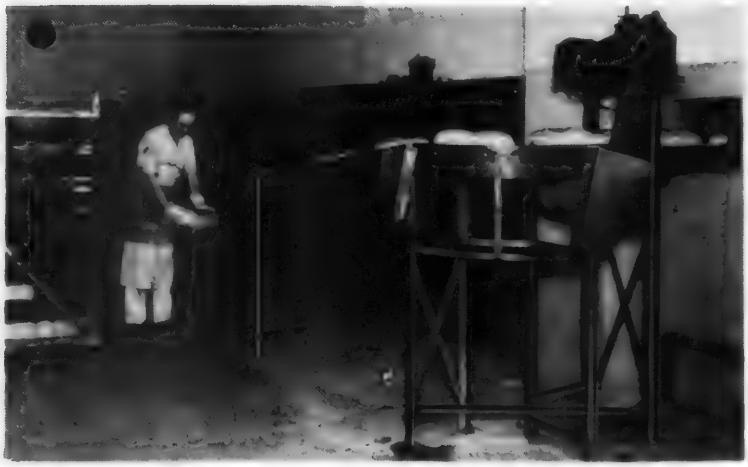


Known for the control of calorifiers, tanks, vats and other vessels containing liquid to be maintained at a differential of approximately plus or minus 2° F. is the "VT" automatic temperature regulator of the Drayton Regulator and Instrument Co., Ltd.

This is made in three types, according to the size of valve in use. As the energy available to operate the valve is limited, the regulator is usually fitted with a double-seated balanced valve, although single-seated valves may be employed when the pressure through the valve is sufficiently low. Double-seated valves are quite satisfactory for regulation purposes, but cannot be guaranteed to give a dead-tight shut-off under no-load conditions.

The VT, regulator, with ½ in., ¾ in., and 1 in., valves, is suitable for small hot-water calorifiers and similar vessels with a differential of 6—7° F., although this may be considerably less under favourable conditions. This model should only be used for liquid immersion.

The widest field of application is represented by the VT, regulator, which is used for such purposes as bottle washing machines, wool scouring machines, soaking tanks, and pits. It is fitted with all sizes of double-seated valves up to 3 in., and usually has a differential of about 4° F., or slightly closer under favourable conditions. Although recommended principally for immersion in liquids, this regulator has been satisfactorily applied to simple types of air heating plant, retorts, and cabinet cookers where the degree of control necessary is not critical.



By this conveyor in a London bakery loaves are carried more than 100 feet for delivery to the inspection and despatch department.

The Conveyor in the Food Industry

The provision of conveyors for the food industry and their installation in any factory without necessitating structural alterations or changes in production sequence is undertaken by A. and C. Jenner, Ltd. The illustration shows part of a typical conveyor recently installed in a London bakery by which loaves are carried more than 100 feet for delivery to the inspection and despatch department. These "driven tracks" are made in various sizes, can turn through any angle involving as few as two or as many as thirty driver rollers, and can carry articles up to 100 lb. in weight.

Automatic Filling Machinery

A new type of machine for automatically feeding tubes and vials has been introduced by The Automatic Weighing and Packing Machine Co., with a speed of forty per minute. Where they are corked a press is provided for setting down and a screwing attachment for screw caps. The same type of machine with special filling head is used for crystal penicillin and a spinning gear is provided to seal the metal cap over the stopper. Dyes, chemicals, and pharmaceuticals can also be satisfactorily handled. For the precision filling of liquids and drugs a mechanically operated syringe is provided.

Transport Developments

New five and seven tonner models with under-floor engines have been announced by Commer Cars, Ltd. This engine, a six cylinder overhead valve unit developing 109 b.h.p., lies substantially horizontal in chassis below the floor of the driver's cab, leaving the floor area of the cabin entirely clear and providing a load distribution in the ratio of 30 per cent. on the front axle to 70 per cent. on the rear, while 76 per cent. of the overall length is available for load, body length being one and a third times that of the wheelbase.

Diaphragm Valve

Produced in many sizes and with different variations, the valve manufactured by Saunders Valve Co. features a resilient diaphragm which acts as a seal for opening and closing and also for segregating the working parts from the fluid handled. It caters for a wide range of services from compressed air and water to the strongest acid, and one variation of the valve has a glass-lined body which ensures its inability to cause contamination or discoloration.

Change of Address

The head office of the Association of Supervisory Staffs, Executives and Technicians is now situated at 110, Park Street, London, W.1. Telephone: Mayfair 8341/2.

Draught Excluders

Of aluminium construction, the Champion automatic draught excluder, manufactured by Medcalf and Co., Ltd., is screwed to the foot of the door, flush with the bottom, and is surmounted by a tube, about the size of a pencil, towards one end, containing a spring loaded plunger. While the door is closed an aluminium bar extends below the bottom of the casing and makes close contact with the floor. Immediately the door begins to open this draught excluder bar rises vertically out of sight.

Pneumatic Pump for Liquids

Operating with compressed air for pumping liquids by pneumatic action, the "Ejectopump," produced by Gresham and Craven, has no moving or rotating parts, no glands, or bearings. The pumped liquids are neither aerated, agitated, nor emulsified, and the pump handles thick, viscous, or solid laden liquids, hot or cold. Maintenance is negligible and no lubrication is needed.

Its application to the food industry is already widespread, being used for pumping chocolate, glucose, jams, fruit pulps, soups both clear or containing vegetables and meat.

For whole or stone fruits which must not be damaged or crushed, a special full bore power-operated valve is fitted to the standard pump.

Power Plants

The success of Diesel-driven self-contained power plants in alleviating the strain which the ever-increasing demand for power has put on the electricity authorities has been one of the notable features of manufacturing organisation during the past year.

Makers of food products have not been slow to take advantage of the fact that throughout the year the Government have provided every facility for the manufacture and installation of such generating plants.

Power Application, Ltd., distributors of plant of this nature, report that in spite of the tremendous demand which has existed since the tragic break-down period of last winter, self-contained installations are still available covering a wide range of power requirements, whether the need is for an output of 30 or 300 kilowatts.

Alimentary Paste Machine

Based on the current model, a new Piscaglia automatic alimentary paste machine, details of which are available from Mac-Rex Food, Ltd., is designed to give continuous production. The incorporation of a double mixer of rustless steel gives a more thorough mixing of ingredients, the length of its screw ensuring perfect kneading. Improvements embodied in this machine include a double revolving head which permits change of dies without interrupting production, adjustable pinions to ensure silent running, pressure greasing, and the employment of canalised shafts and spindles which obviates the necessity of pegs. The strong pressure on the shafts, which can be instantaneously dismantled for cleaning, is absorbed by a special arrangement.

Electrical fittings include electro-magnetic control to stop the motor at overloads of 30 per cent. and a loud sound warning for overloads of 20 per cent., which completely eliminate difficulties arising from hardened paste. By means of a simple adapter it is possible to centralise at will on the control panel the working of the preliminary drier and pneumatic conveyor.

Destruction of Mould Growths

In all factories and stores where produce of a perishable nature is handled there is always the danger of damage by mould and fungus growths on interior surfaces. A water-base material known as Prevenit has been placed on the market by Clariloid Chemical Co., Ltd., to combat this danger. This hygienic wall finish is suitable for application on all absorbent surfaces and is effective in preventing a recurrence of mould growths.

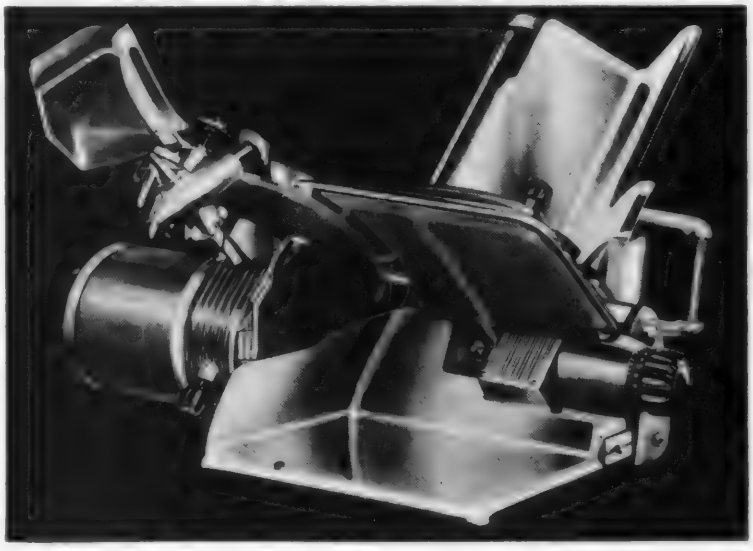
Food Service Equipment

Boiling pans, frying ranges, automatically controlled café sets, bulk water boilers, and jacketed boilers are some of the wide range of equipment manufactured by G. F. E. Bartlett and Sons (Metal Workers), Ltd. Specialising in the design, manufacture, and installation of tea service schemes, the company are well known for their "Speediserv" trolleys for the distribution of tea.

Science in the Fishing Industry

An experiment in the use of Echo sounding apparatus as a means of fish detection recently carried out on the Cornish coast proved that the equipment not only pinpointed the position of the shoals but recorded their length and density. This experiment was sponsored by the Ministry of Agriculture and Fisheries and further experiments will be continued in the Firth of Forth during the winter herring season. The complete apparatus, too complex for fishing vessels, could be adapted to the requirements of the fishing industry, and the use of a modified version of Asdic was also urged by Dr. H. Wood of the Torry Research Station.

These favourable reports contrast with the opinions of some of the more critical practical fishing interests which had declared that such instruments could not replace the skill of experienced fishermen.



Slicing, Mincing and Mixing Machinery

Capable of cutting meat, bread, vegetables, cheese, and fish into slices from paper thickness to three-quarters of an inch with forty graduations is the electric gravity feed slicer illustrated here. It can be instantly dismantled for cleaning without tools and every part of the machine is easily accessible when cleaning. It has a safety cut-out switch on removing the knife guard. Finished in stainless steel and various shades of plastic enamel, this is one of the classes of equipment manufactured by the Swallow Engineering Co., who also make 20 and 30 quart electric mixers and electric mincers with capacities ranging from 300 to 1,000 lb. per hour.

FORTHCOMING EVENTS

Industrial Exhibition

The Engineering and Industrial Equipment (Home and Export) Exhibition, to be held at the Royal Horticultural Hall from March 10 to 24 this year, will be of special interest to all connected with industry and commerce.

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Health Congress at Harrogate

The Right Hon. Lord Inman has accepted the office of President of the Health Congress, which is to be held at Harrogate from May 24 to 28 next by the Royal Sanitary Institute.

Eight sections have been arranged for the Congress, and these will deal with preventive medicine, engineering and architecture, maternal and child health, veterinary hygiene, food and nutrition, housing and town planning, tropical hygiene, and hygiene in industry. In addition, there will be conferences of medical officers of health, engineers and surveyors, sanitary inspectors, and health visitors.

Among the Presidents of sections and conferences will be the following:

Professor G. S. Wilson, Director, Public Health Laboratory Service; Professor P. A. Buxton, C.M.G., Professor of Entomology, London School of Hygiene and Tropical Medicine (University of London); Professor Andrew Topping, Professor of Preventive Medicine, University of Manchester; Professor R. E. Lane, Professor of Industrial Health, University of Manchester; Mr. J. H. Forshaw, M.C., Chief Architect and Housing Consultant, Ministry of Health; Mr. J. B. L. Thompson, M.C., President, Institution of Municipal Engineers; Mrs. M. D. Baird, chairman, Public Health Committee, Aberdeen; Mr. H. B. Allan, Superintending Inspector, Animal Health Division for Yorkshire, Ministry of Agriculture and Fisheries; Dr. F. Hall, C.B.E., President, Society of Medical Officers of Health; and Mr. H. Priestley, M.B.E., Chief Sanitary Inspector, Blackpool.

The food and nutrition section of the Congress will be held jointly with the Food Group of the Society of Chemical Industry, whose chairman, Dr. E. B. Hughes, will act as President of the joint meeting.

British Industries Fair

The location of trade groups for the forthcoming British Industries Fair will be as follows:

London, Olympia:

Brushware; Musical Instruments; Radio; Fancy Goods, Sports Goods; Toys and Games and Baby Carriages; Chemicals; Chemists Supplies; Scientific, Optical, and Photographic Goods; Office Appliances; Printing Machinery; Jewellery, Silverware, Cutlery, and Clocks and Watches; Stationery, Paper, Printing and Publishing.

Earls Court:

Leather, Leather Goods, and Boots and Shoes; Clothing and Textiles; Plastics; Furniture, Bedding, and Carpets; Pottery and Glassware; Foodstuffs and Beverages; Suction Cleaners; General and Sales Services; Commonwealth and Empire Section.

Birmingham, Castle Bromwich:

Hardware, Ironmongery, and Brassfoundry; Building and Heating; Electricity; Engineering, Metals, Transport, Gas.

*

Royal Institute of Chemistry

The second part of the Spring Programme of the Royal Institute of Chemistry is as follows:

Mar. 8. "Colour photography." H. Baines, D.Sc., F.R.I.C., Hon. F.R.P.S.; at Woolwich Polytechnic, S.E.18, at 6.45 p.m.

Mar. 15. "Physico-chemical concepts in interpreting drug action." A. Albert, Ph.D., F.R.I.C., Hon.F.P.S.(Victoria); at Dartford County Technical College, at 7.15 p.m.

Mar. 17. "Emulsions and emulsification." A. E. Alexander, B.Sc., Ph.D.; at Royal Institution, Albemarle Street, W.1., at 2.30 p.m.

Mar. 19. "Anaesthetics." Professor H. B. Nisbet, Ph.D., D.Sc., F.R.I.C.; venue to be announced later, at 6 p.m.

Mar. 20. "Nutrition in relation to post-war problems." F. Wokes, B.Sc., Ph.D., F.R.I.C.; at Dagenham Technical College, at 3 p.m.

Apr. 1. "A day in the life of an alkali inspector." W. A. Damon, C.B.E., B.Sc., M.I.Chem.E., F.R.I.C.; at Luton Public Library Lecture Hall, at 7.30 p.m.

Apr. 15 and 16. Annual General Meeting of the Institute at Birmingham.

Apr. 21. Symposium, "Laboratory layout and construction." C. L. Prior, Professor W. H. Linnell, J. Haslam, and others; at the London School of Hygiene and Tropical Medicine, at 4 p.m.

Apr. 22. "The chemistry of packaging." G. L. Riddell, Ph.D., F.R.I.C.; at Medway Technical College, Gillingham, at 7.30 p.m.

Apr. 24. "A day in the life of an alkali inspector." W. A. Damon, C.B.E., B.Sc., M.I.Chem.E., F.R.I.C.; at Brighton Technical College, at 5.45 p.m.

May 1. May Day Social at Oak Restaurant, 18, Kensington High Street, W.8.

Education and Industry

Another instance of the willingness of industry to co-operate with the Education Authorities recently occurred in Birmingham where, as in other towns, the raising of the school leaving age to 15 has presented the schools with the difficult problem of furthering the education of the 14 to 15 year old Elementary School pupil.

One of the Perry Barr Council Schools has tackled the job with commendable foresight. Their scheme includes arrangements to take parties of the older boys to various Birmingham factories where, by seeing for themselves how things are made, the pupils are not only given the opportunity to increase their general knowledge, but they are also able to study conditions of employment that will prove invaluable when the time comes for them to choose their own career. The experiment has the approval of the Birmingham Education Committee and is being watched closely by the Birmingham Chamber of Commerce.

As part of the experiment, a party of forty of the boys recently visited the works of George Ellison, Ltd., and were shown the incoming raw materials and the various stages in the manufacture of electric switchgear—tool rooms, machine shops, and assembly bays.

That the pupils were extremely interested in what they saw was evidenced by the continual flow of questions with which they bombarded the guides, who were careful to draw particular attention to the relationship of school mathematics to engineering practice.

Change of Name

In future the Aluminium Plant and Vessel Co., Ltd., will have the formal title of The A.P.V. Co., Ltd.

Booklets Received

A booklet entitled *Vegetarian Recipes* which gives a selection of recipes planned to change available ingredients into attractive and satisfying vegetarian meals, has recently been issued by The Vegetarian Society.

*

A comprehensive brochure indicating the nature and scope of the hydrolysed protein Protex has been published by Fredk. Boehm, Ltd. Details of the use of this product, which has a high amino-acid content, in the flavouring of soups, canned foods, and pastes are given.

*

A paper on the responsibilities of the purchasing officer presented at their 1947 National Conference has been published by the Purchasing Officers' Association. In an effort to clarify the confusion which exists over the duties which should be delegated to the buyer, the latter's responsibilities involved in the acquisition of goods for a manufacturing firm are detailed under various headings. The increased importance attached to this office is stressed and the paper concludes with an assurance of the Association's competence to give authoritative advice to industrial concerns on matters touching this function.

*

First of a series on modern meat marketing, a concise booklet on mutton has been prepared by W. J. Duncum, M.Inst.M., A.R.I.P.H.H., general information is given as to the joints of sheep carcass and their bone structure, characteristics of lean, bone and fat, offals of the sheep, trade names and wholesale cuts, and an explanation of cutting technique well illustrated by plates.

*

Brief descriptions of the various types of evaporative coolers in current use together with illustrations of typical plants recently supplied are given in a catalogue produced by the Visco Engineering Co., Ltd. Several pages are devoted to meteorological information and some useful tables on power consumption are also included.

OBITER DICTA

● If one cooks bacon, it becomes hot.—*Dr. Edith Summerskill.*

● Makers of durable sausages. —*English entry in a Swiss directory of food manufacturers.*

● In an ocean of talk about food, the most overdone word in the English language is calories.—"*News Review.*"

● The Minister of Food is now known among the farm workers not as the Minister of Food, but as the minister of bread and cheese.—*Mr. A. E. Baldwin, M.P.*

● Chocolate eating now enters the category of expensive vices among which smoking has for some time been included.—"*Glasgow Herald.*"

● Why must we have these tons of apples from New Zealand? Why cannot we have tons of butter instead?—*Correspondent to "The Times."*

● I am cutting my talk short because the human mind can absorb only as much as the human seat can endure.—*An American convention speaker.*

● The magnitude of the nut milk industry in England denotes the magnificent scale on which coconut helps to feed the people of England.—*Free Press Bulletin, Bombay.*

● I shall never rest until every drop of drink, every crumb of food is made free of bacteriological impurity.—*Mrs. A. W. Wakefield, President of the National Council of Women.*

● "You were brought in here for drinking," lectured the police sergeant to the inebriate. "Thash mighty fine, Sarg," replied the culprit, "lesh get on with it."—*Ice Cream Review, U.S.A.*

● I cannot see why retired colonels in Devonshire should have exactly the same rations as men doing heavy work in a climate as cold as Perthshire.—*Dr. J. A. Morris, medical officer for the Fife towns of Ladybank, Cupar, and Falkland.*

● One realises the necessity of a sound system of retailing, but when we read daily of harassed retailers being heavily penalised for criminal and indictable offences one is forced to ask if the system is working properly.—*A solicitor at Llandudno.*

Packaging for Export

In supplement No. 2 to B.S. 1133:1943 ("Recommendations for Preservation and Packaging for Tropical Theatres of War"), a brief summary of the methods of preservation and the three principal methods of packaging is given. The methods are fully described in Section 3 of the main Packaging Code. It is not claimed that the instructions given for preservation and packaging are detailed and it is therefore necessary that they should be studied carefully and each item considered on its merits. The Supplement should be in the main used as a general guide.

Some of the articles and instructions listed apply only to the Services, but it should be possible to find parallels in the Supplement for almost all industrial commodities and equipment likely to be exported.

Copies cost 7s. 6d. post free, and its value to industry lies particularly in its authoritative instructions and its details of the correct methods of packaging. Copies of Section 3 (corrosion prevention) of the main packaging code are available price 6s. post free.

Food and Nutrition

The address delivered on the occasion of the Food Education Society's Annual Meeting held in London on November 12, 1946, entitled "Scientific Approach to Food Problems during the War," given by Sir Jack Drummond, D.Sc., F.R.I.C., F.R.S., has now been published in book form and is available from the Society, price 1s.

Obituary

The death occurred at Kirkella, near Hull, on February 6, of Mr. Ernest Ostler, founder of Ernest Ostler, Ltd., bread and flour confectioners, sausage, pork pie and cooked meat manufacturers, established in 1894. He leaves a widow, one son and one daughter.

His son, Mr. Ernest R. Ostler, chairman and managing director of the company, who has carried on the business since 1934, has done, and will do, much to further the interests of the business his father started so many years ago.

Overseas Items

Cocoa Planting in Malaya

Large-scale experiments to introduce cocoa planting in Malaya are being made in Kuala Lumpur with seeds from Ceylon and Trinidad. Hitherto, imported seeds deteriorated during the long sea voyage from Trinidad. Importation from Ceylon, however, means a comparatively short transit time.

Minor experiments have already been carried out at the Union Government's agricultural experimental station.

Chipped Ice for Fresh Produce Storage

Spoilage of fresh fruit and vegetables, which in the United States alone destroys enough food to feed 5,000,000 people each year, can be prevented with the aid of chipped ice, Professor Martha Potgieter and Catherine Cowell of the Home Economics Experiment Station, University of Connecticut, Storrs, Connecticut, state in a report to the American Chemical Society.

Recent investigations have shown that the appearance, flavour, and nutritive value of tomatoes, lettuce, celery, spinach, and other green, leafy vegetables can be preserved by packing the fresh produce in chipped ice, either natural or artificial, during handling and storing.

New Zealand's Increased Production

Increased butter and meat production has been announced by the New Zealand Minister of Agriculture, Mr. Edward L. Cullen, who reported an increase of over 15 million pounds of butterfat in the first four months of the present dairy farming season and said lamb killings were 80 per cent. greater in November than in the same month last season.

Export of butter gradings for the five months ended December 31, 1947, were 79,800 tons, an increase of 9,200 tons compared with the same period of the previous season. Exports of cheese gradings were also greater and meat export figures for November were more than double those for the previous November.

Research in Canada

Comprising 146 pages, the review of the National Research Council of Ottawa, Canada, covering the work achieved during 1947, includes a section on the organisation of the Council, followed by reports of the laboratory and research divisions.

In food chemistry much of interest to industry has been achieved. Work is continuing on refrigerated storage of meats, processing of liquid and dried eggs, and dairy products. It has also been found that the baking properties of sugar-egg powders improve as the nozzle size is reduced within practical limits. Considerable progress has been made on the German Fritz continuous butter machine with a view to its adaptation to Canadian requirements. Dried whey has been tested as a component in sponge cakes with promising results.

Fermentation studies, which earlier produced butanediol from low-grade wheat and surplus crops for use as anti-freeze and as a source material for numerous organic chemicals, have been extended, and a flash-drying unit for processing gluten has been found to yield a product of high quality.

Tenderising Beef

Tests are under way for feeding radio-active iodine in excess amounts to beef animals, resulting in the destruction of the thyroid gland and making the animals fat and lazy. Dr. G. H. Copp of the University of California stated at a recent conference that better and more tender beef should result from such tests.

Donegal Canners

Owing to difficulties in developing the site at Killybegs for the erection of a canning factory, Donegal Canners, Ltd., have transferred their activities to Ballyshannon, Co. Donegal, where existing premises have been taken over.

Instrument Conference

Sponsored by the Instrument Society of America with the co-operation of the American Institute of Physics, Industrial Instruments and Regulators Committee of the American Society of Mechanical Engineers, and Instruments and Measurements Committee of the American Institute of Electrical Engineers, the third Instrument Conference and Exhibition is to be held at the Convention Hall, Philadelphia, from September 13 to 17, 1948.

British Industries Fair

INFORMATION FOR VISITORS

Bona fide visitors to the British Industries Fair may obtain visas, without charge, on application to the nearest British Consular Officer and those intending to bring their cars should approach their national Automobile Association.

Enquiry bureaux will be at Euston and Paddington stations in London and at New Street and Snow Hill stations in Birmingham, where interpreters meet the principal trains.

Provisional arrangements have been made by the Ministry of Food to issue temporary ration cards to overseas visitors where necessary, details of which may be obtained from the enquiry office in the Overseas Buyers' Clubs which will be situated in each building.

Detailed information of exhibitors in the Birmingham Section can be obtained on application to the Birmingham Chamber of Commerce Inc., 95, New Street, Birmingham; enquiries regarding accommodation should be addressed to the Accommodation Officer, at the same address.

New American Canning Process

Development of a "flash heating" process which some scientists believe may revolutionise the canning of foods, especially of the liquid or semi-liquid types, was announced at a recent food processors' conference at the University of California.

The food is exposed to temperatures of 250° to 300° F. for a few seconds, cooled rapidly, and put immediately into cans which have previously been sterilised, according to Dr. W. Martin of the Schwarz Engineering Co. of San Francisco.

The raw food is heated quickly by passing it through a tube surrounded by live steam and the can filling is done under superheated steam, at ordinary atmospheric pressure.

The process will make possible the canning of many additional foods, such as those with a milk base. It is particularly suitable for liquid or semi-liquid foods, fruit and vegetable juices, chocolate milk, baby foods, vegetable *purée*, soups, cream-style corn, evaporated milk, and various desserts and puddings.

Oil Crops in Australia

It has been recommended that the Commonwealth and States of Australia set up a Vegetable Oils Committee comprising a representative each of the Department of Commerce and Agriculture, and the C.S.I.R., one from each of the participating States and one from the vegetable oil processing industry. This committee should be charged with the duty of recommending a broad policy on vegetable oil production to the Agricultural Council.

In view of the outstanding success that has followed the selection and hybridisation of soya beans and other vegetable oil producing plants in U.S.A. and Canada, and the unanimous advice of leading authorities in these countries, the States out of funds made available by the Commonwealth Government should undertake an intensive programme of plant breeding and selection and testing of soya beans and other vegetable oil producing crops appropriate to their environment, and they should strengthen their agronomic and plant-breeding staff accordingly.

Rice Mission Arrives in West Africa

INCREASED PRODUCTION AIM

A mission consisting of Mr. W. M. Clark, formerly Director of Agriculture in Bengal, and Mr. F. H. Hutchinson, former Chief Irrigation Engineer in the United Provinces of India, has arrived in British West Africa to advise, in consultation with the Colonial Governments concerned, on existing schemes of rice production in the British West African territories and to investigate and report on the possibilities of expanding rice production in new areas by mechanised or other means. The mission will also advise on the location and extent of any areas considered suitable for small-scale jute cultivation trials.

The object of the mission is to determine how best the four British West African territories can help in meeting the present world shortage of rice, whether by satisfying their own demands or by producing a surplus for export to areas in which rice is in short supply.

The present production of rice in the four British West African territories is about 250,000 tons, nearly all of which is grown in Sierra Leone.

Edible Oil in Poland

Up to the end of September, 1947, Polish factories have produced over 9,300 tons of raw oil, over 11,000 tons of refined oil, 325,000 tons of technical oils, over 1,300 tons of fatty acids, over 10,000 tons of oil-cakes, 360 tons of soap, and nearly 300 tons of washing powder.

Production plans for 1948 anticipate a total output of fats and oils amounting to 105,000 tons.

Frozen Food Packs

The clear-view window package for shrimps and similar frozen foods, designed by the Sylvania Division of the American Viscose Corporation, allows the purchaser to see what is being bought, shows off the product to advantage, and makes up into attractive self-service displays. The package of shrimps shown here and overwrapped with a new grade of Sylvania cellophane, especially designed for frozen food work, provides clear visibility, seals in moisture, withstands low temperatures without becoming brittle, and handles well on high speed wrapping machines.

Demand for Foreign Journals

The Australian Council for Scientific and Industrial Research reports an increasing demand for overseas scientific and technical papers. During the past year translation teams have had to be increased to deal with reports in German, Russian, French, Swedish, Italian, Spanish, and Portuguese.

Italy's Fruit and Vegetables

With a rapidly increasing production approaching 9,000,000 tons per annum, Italy's fruit and vegetables will not be able to find a market unless they are admitted into Germany. At the present time, only half of the total production finds a market and if no action is taken this flourishing Italian industry will begin to decline.

Soviet Food Developments

A new type of orange, suitable for cultivation in the northern sub-tropics, and tea leaves that can withstand 30 degrees of frost, have been evolved by the Soviet plant experimental station at Sochi, on the north-east coast of the Black Sea.

Queensland's Beef Production

During 1947, Queensland had a record production of more than 100,000 tons of beef, worth approximately £5,500,000. Nearly 90,000 tons of this beef were exported, and three-quarters of Australia's export beef during 1948 will come from Queensland.

The full impact of the 1946 Queensland drought is expected to be felt in 1950 and 1951, when calves born during 1946 will mature.

Packaging for Bakers

The "clear-view" display package for baked goods, which seals in the product's oven-freshness, has an overwrap of moistureproof cellophane. The illustration shows a coffee ring. Capable of easy stacking, the box is rigid enough to keep its contents from being crushed This pack is designed by the Sylvania Division of the American Viscose Corporation.

A New Colour Microscopy Process

FOR CHECKING ADULTERATION OF FOODS

The new microscopy technique, developed by Germain C. Crossmon, of the Bausch and Lomb Optical Co., provides a speedier, more accurate identification of a wide range of colourless, transparent substances, including drugs and minerals.

In a recent talk before the American Association for the Advancement of Science, Crossmon termed the technique "dispersion staining" and showed colour photographs of thin sections of body tissue in which muscle fibre, blood vessels, and fatty tissues appeared in bright contrasting colours.

It was demonstrated that only standard microscope equipment was required to turn transparent, colourless objects to bright colours. By choice of the correct immersion liquid which was placed over the sample, each different material appeared a different colour.

The apparent magic by which white light on a colourless object produced colour had a sound scientific explanation. Crossmon pointed out that the light from the microscope lamp was passed through a dark-field substage lens to strike the sample at a high angle. The sample was covered with a high dispersion liquid that matched the light-bending ability of different materials in the sample at different portions of the colour spectrum.

Each material then scattered some of the colours present in the white light into the microscope where they were seen by the observer while other colours passed directly through the sample at such a high angle that they did not enter the microscope.

The new method is expected to increase use of the microscope in checking foods or drugs for adulteration or contamination, testing minerals or ores for impurities, and textiles for fibre identification.

Australian Exports

Lord Vestey, head of the big British meat and shipping interests in Australia, has forecast an end to exports of Australian beef by 1960 because of the increased consumption in Australia, unless a comprehensive plan for greater production can be initiated. The Council for Scientific and Industrial Research, which has supplied information supporting Lord Vestey's view, gives as the main reasons inadequate transport in outback areas, uncertain land tenure, and labour scarcity.

A New Antioxidant

Claimed to prevent rancidity in potato chips for 358 days at room temperature, a new antioxidant developed by the American Meat Institute also shows superior properties in protecting pastry from rancidity. Experiments showed that pastries made with it remained fresh for 556 days at room temperature and 488 days in an oven maintained at 145° F. Colourless, odourless, and fat-soluble, this product is economical in comparison with other antioxidants, and studies over a period of two years show no evidence of toxicity when fed in several hundred times the amount required in lard.

Malayan Rice Plans

Schemes to increase the production of rice in British Malaya include the spending of 4·8 million dollars during the current financial year on new drainage and irrigation works and the improvement of existing undertakings, reclamation of paddy land, and provision of selected seeds and manure. These will provide an additional area of 80,000 acres under rice. Plans are also under consideration for the progressive development of all available wet paddy land, estimated at 700,000 additional acres, with the intention of bringing this area into rice production within a few years.

Food Manufacture

News from the Ministries

Wheat Commission

Mr. Thomas Harry Gill, J.P., of the Co-operative Wholesale Society, has been appointed a member of the Wheat Commission representing the interests of millers of flour.

Labelling Amendments

The Labelling of Food Order, 1946, has been amended in respect of sauces, custard and blancmange powders, advocaat, soft drinks and still spa waters, and unfermented apple juice.

The principal new provisions are as follows:

1. Following the removal of sauces from price and licensing control, it will now be necessary for sauces other than thick mixed fruit sauces, thin sauces of the Worcester type, and tomato sauce or ketchup, to be labelled with a declaration of ingredients.
2. Custard and blancmange powders may be sold without a declaration of ingredients on the label as the composition of these products may possibly vary from time to time owing to the shortage of certain ingredients.
3. Advocaat, which has a normal alcohol content lower than that prescribed in the Labelling of Food Order, may be sold if it contains not less than 30 per cent. proof spirit.
4. On account of the deconcentration of the soft drinks industry and the return to the use of brand names, soft drinks, still spa waters, and unfermented apple juice must now comply with the provisions of the Labelling of Food Order, except that soft drinks and still spa waters will be exempt from the need to declare ingredients and the minimum quantity of contents.

The Order came into force on December 20, 1947, except in regard to sauces, soft drinks and apple juice. In the case of sauces, other than those specified above, the Order applied from February 1, 1948, as regards sales by packers and labellers; from May 1, 1948, as regards sales by wholesalers, and from August 1, 1948, as regards retail sales. In the case of soft drinks, still spa waters, and apple juice the Order will apply three months later at each stage of sale.

Manufactured and Pre-Packed Foods

The Manufactured and Pre-Packed Foods (Control) Order has been amended to include within the licensing provisions of the main Order toffee apples, chocolate-covered apples, and any other fresh fruit covered with chocolate or sugar confectionery.

The amending Order, which came into force on February 1, excludes from the scope of the main Order soft drinks in solid, semi-solid, or powder form. This means that solid soft drinks which are already excluded from the Soft Drinks Order will not have to be licensed under the Manufactured and Pre-Packed Foods Order.

Soft Drinks

To provide for the restoration of normal trade practices in the soft drinks industry following the conclusion of the concentration scheme governing the industry on January 31, 1948, the Minister of Food has made the Soft Drinks Order, 1947, which came into force on February 1, 1948, its main provisions being as follows:

1. Manufacturers may once again make soft drinks according to their own formulae and use their own labels.
2. Selling prices, and deposit charges or allowances on returnable containers, will no longer be controlled. During the operation of the concentration scheme only a limited range of drinks was allowed to be made. The prices of these drinks were fixed in 1943 and have remained unchanged. With the return of individual varieties it is expected that some prices will be higher and others lower than those to which the public has been accustomed for the last five years.
3. The transport of soft drinks will be unrestricted except where general restrictions are in force.
4. To protect the public from the manufacture and sale of worthless drinks, the Order prescribes minimum sugar and fruit juice contents and sets a limit to the amount of saccharin that may be used.

The new Order contains no provision as to citric or other acid content and makes no change in the present minimum fruit juice content. Sugar must now be added in quantities at the rate of not less than 18 oz. per 10 gal. finished beverage for ready-to-drink beverages and not less than 7½ lb. per 10 gal. of finished beverage for drinks for dilution and for non-alcoholic wines. The maximum saccharin content for ready-to-drink beverages is to be 82 grains and for drinks for dilution ⅞ oz.

The new Order came into force generally on February 1, 1948, but manufacturers have been able to make drinks under the new provisions from January 26.

Eire Egg Agreement

It was announced in November last that as a result of the talks between British and Eire Ministers about exports of eggs agreement in principle had been reached on a proposal that the Eire Government should undertake a scheme for the development of the poultry industry. It was also agreed that the details of such a scheme should be discussed between representatives of the Eire Department of Agriculture and the Ministry of Food.

This was done at a conference in Dublin in January and it has now been agreed that the Eire Department of Agriculture will put into immediate operation a comprehensive programme of development, extending over three years, designed to secure a substantial increase in poultry stocks and egg production.

The cost of the scheme, which will be borne by the Eire Government, is estimated at £1,350,000 over a three-year period. The Ministry of Food for their part will pay a sum similar to that expended by the Eire Government. This will be done by way of a special bonus on eggs received from Eire at a rate per great hundred (120 eggs) subject to annual review. The Eire Minister for Agriculture has decided that this bonus, which will be placed at his disposal, will be used to improve the export price of eggs so that production may be increased with the greatest possible speed.

Food Standards Committee

COMPOSITION OF FOODS TO BE REVIEWED

A Food Standards Committee has been appointed with power to review the composition of foods (other than liquid milk), which will replace on a permanent basis the Inter-Departmental Committee on Food Standards set up in September, 1942. This committee will advise the Ministers of Food and Health and the Secretary of State for Scotland as to regulations which can be made under the Defence (Sale of Food) Regulations, 1943, and the Food and Drugs Act concerning the composition of foods (other than liquid milk).

The committee's function will be to recommend food standards, based on quality and nutritional value, designed to protect the consumer against the sale of inferior products.

The committee includes members nominated by the Food Manufacturers' Federation, Inc., the Medical Research Council, the Parliamentary Committee of the Co-operative Congress and the Society of Public Analysts, and other analytical chemists and representatives of the Ministries of Food and Health, the Department of Health for Scotland, and the Department of the Government Chemist.

The following have been appointed to the committee:

Dr. Norman C. Wright, M.A., D.Sc., Ph.D., F.R.I.C., Chief Scientific Adviser to the Ministry of Food (Chairman); G. G. Barnes, Esq., C.B.E. (Vice-Chairman); C. A. Adams, Esq., B.Sc., F.R.I.C.; P. N. R. Butcher, Esq.; Professor S. G. Cowell, M.B., F.R.C.P.; Sir Jack C. Drummond, D.Sc., F.R.I.C., F.R.S.; A. Glover, Esq., M.Sc., F.R.I.C.; Sir Harry Hague, M.P.S.; Sir Harry Jephcott, M.Sc., F.R.I.C.; Dr. J. M. Johnston, M.D., F.R.C.S.(Edin.); Dr. G. W. Monier-Williams, O.B.E., M.C., Ph.D., F.R.I.C.; Dr. J. R. Nichols, D.Sc., F.R.I.C.; R. W. Sutton, Esq., B.Sc., F.R.I.C.; G. Taylor, Esq., F.R.I.C.

Mr. K. R. Allen has been appointed secretary of the Food Standards Committee and communications intended for the committee should be addressed to him at the offices of the Ministry of Food, Food Standards Division, Devonshire House, Mayfair Place, Piccadilly, London, W.1.

Pears from Australia

Arrangements have been made in agreement with the Board of Trade for the importation under licence of a limited quantity of pears from Australia during the period February 1 to July 31, 1948.

Onion Prices

On December 20, 1947, the Minister of Food announced that he proposed to make an Order reducing, for a period from about the end of February until the end of June, the maximum prices of onions at all stages of distribution to the level operative before November 9, 1947.

This reduction in the maximum prices will not now take place until late in March. The proposed new Order will, therefore, prescribe the lower prices from March 28, to about the end of June, when the present maximum prices will be restored.

Duty-free Machinery Importation

Under Section 10 of the Finance Act, 1932, as amended, the Treasury are empowered, after consultation with the Board of Trade, to license the duty-free importation of machinery. It is a statutory requirement that application for the issue of a licence under the Section should be made before the machinery is imported.

Cases continually arise in which application is made for a Treasury licence after the consignment of machinery has reached the United Kingdom. Whatever the merits of the case for duty-free importation, it is not possible under the statutory provisions for a Treasury licence to be granted in such circumstances.

Importers should accordingly note that, in the case of any machinery which it is desired to import free of duty, it is essential, in order that the application for exemption from duty may be considered, that the application for such exemption should be made before the machinery reaches the United Kingdom. The application can then be considered on its merits.

Increased Prices for Empire Sugar

Under the agreement by which the Ministry of Food takes over the entire exportable surplus of sugar of the sugar-producing Dominions and Colonies, the producers are to receive for 1948 a gross price increase of £3 per ton. There are certain small adjustments to be taken into account, which vary somewhat for each area, and in the case of the British West Indies bring the average net increase to about £2 16s. 6d. per ton.

Canada, which receives a large proportion of British West Indian and other Colonial sugar, is associated with the United Kingdom in these arrangements.

Dried Fruit

An Order has been made which consolidates, with certain amendments, the Dried Fruits (Control and Maximum Prices) Order, 1943, as amended.

The principal changes in the new Order, which came into force on January 25, 1948, are:

1. Strained baby foods are added to the list of excepted products. This means that a licence will not be required for the manufacture and sale of strained baby foods in so far as the use of dried fruit is concerned.
2. The charge permitted on a sale by wholesale for breaking bulk is increased to 2s. 4d. per cwt. subject to the consent of the buyer having been first obtained. This increase does not affect the maximum retail prices.

Bakery Advisory Panel

Mr. G. H. Mason has been appointed to the Panel of Advisors to the Director of Bakeries, Ministry of Food, in place of the late Mr. Howard Hughes. The panel now consists of Mr. Stanley Brookes, Mr. J. N. Frears, Mr. W. S. Goodfellow, Mr. Victor Joseph, Mr. H. Marriott, and Mr. G. H. Mason.

Information and Advice

Ice Cream

B.2230. *We wish to obtain a formula incorporating the use of glyceryl monostearate in the manufacture of ice cream.* (London.)

Glyceryl monostearate may be used both in the self-emulsifying and the neutral forms, the former being used alone to make an emulsion of 10 to 12 per cent. with water, the latter being used in the same proportion, but with the addition of a small percentage of lecithin as an emulsifying agent. The manufacture of ice cream is, of course, subject to certain regulations governing the content of free fat and sugar, and the use of glyceryl monostearate in no way eliminates the necessity for using the statutory quantity of free fat. The use of glyceryl monostearate as an emulsifier results in a substantial over-run in the course of manufacture, but it is not possible to say whether this normally produces a larger quantity of ice cream of a quality conforming to the regulations.

Separation both in the mix when cold and in the freezer can be overcome by adding glyceryl monostearate ½ oz. per gallon. The margarine is melted in a double jacketed saucepan and the glyceryl monostearate is dissolved in the hot fat. This hot mixture is stirred briskly into the mix when cooled down to between 160° to 150° F. for five minutes. No further stirring should be necessary except just before freezing, neither should any fat separation take place.

Information Supplied

B.2211. *Manufacturers of machinery for nobbing, gutting, and filleting fish.* (London.)

B.2212. *Suppliers of the necessary equipment for the manufacture of potato crisps.* (Perth.)

B.2215. *Suppliers of cellulose packing.* (Warwicks.)

B.2216. *Manufacturers of filling machinery.* (Southern Rhodesia.)

B.2217. *Suppliers of thermometers, boiling kettles, moulds, wrappers, and jelly bottles.* (British West Indies.)

B.2218. *Suppliers of onion and turnip peeling machinery, manufacturers of plastic brine vats, and the address of the British Rubber Development Board.* (Lincs.)

B.2219. *Addresses of biscuit machinery manufacturers.* (Eire.)

B.2220. *Manufacturers of electric potato crisping machines, sieving machines for apples and tomatoes, and suppliers of electric air purifiers or deodorisers.* (Staffs.)

B.2221. *Manufacturers of power driven bread slicing machines.* (Eire.)

B.2225. *Manufacturers of waxed paper containers, suppliers of stiff paper outer covers for jam jars, and suppliers of machinery for topping, tailing, and peeling onions.* (Lincs.)

B.2227. *Suppliers of machinery for the manufacture of meat and fish paste.* (Australia.)

B.2228. *Suppliers of tin tubes for packing food products.* (Norway.)

B.2229. *Manufacturers of bench labelling machinery, electric cake/dough mixers, and secondhand machinery suppliers.* (Lancs.)

B.2232. *Suppliers of juice extractors.* (Lancs.)

B.2233. *Firms specialising in expanded rubber insulation.* (South Africa.)

B.2234. *Suppliers of gelatinised and dextrinised flours and starches.* (London.)

B.2236. *Manufacturers of fish and fruit canning plant.* (India.)

B.2244. *Makes of filling machines for soups and purées.* (Cumb.)

B.2254. *Suppliers of pressure cookers for fish.* (Lancs.)

B.2257. *Suppliers of bottle filling and cleaning machinery.* (London.)

B.2259. *Suppliers of mono sodium glutamate.* (Glam.)

B.2260. *Manufacturers of machinery for printing, making, and filling cartons as a continuous process, and of powder-filling machinery.* (Yorks.)

B.2261. *Suppliers of machinery for the manufacture of potato crisps.* (Durham.)

B.2265. *Suppliers of printed aluminium foil in reels with wax or other paper backing, suitable for wrapping beef cubes.* (Lancs.)

B.2267. *Manufacturers of adding machines.* (Devon.)

B.2268. *Suppliers of 12 gallon rustless milk churns.* (Lancs.)

B.2269. *Recipes for piccalilli and pickled onions.* (Norfolk.)

B.2270. *Suppliers of olives and method of bottling.* (Lancs.)

B.2274. *Manufacturers of waxed cardboard jam jar closures.* (Lancs.)

B.2278. *Suppliers of lacquered cans.* (Yorks.)

B.2281. *Manufacturers of desiccating machinery.* (London.)

B.2284. *Recipes for plain and milk chocolate.* (Herts.)

B.2285. *Suppliers of elastic bands and lids for 1 lb. jars.* (Durham.)

B.2286. *Suppliers of equipment for the manufacture of cereal products.* (Bucks.)

B.2290. *Literature in connexion with herb growing.* (Middlesex.)

B.2291. *Suppliers of food colours for export trade.* (London.)

Information Required

B.2275 and B.2302. *Suppliers of dried blood suitable to take the place of fresh blood in the manufacture of black puddings.* (Glasgow and Liverpool.)

B.2292. *Manufacturers of cake icing equipment.* (Gold Coast.)

B.2312. *Name and address of the manufacturers of Alroids and Smith's liquorice and peppermints.* (London.)

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents," and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

590,575. WALLIS TIN STAMPING CO., LTD., WILLIAMS, A. J., and DYSON, W. J.: Bottles, jars, and like containers and closures therefor.

590,577. HOBSON, L.: Methods of storing preserved eggs.

590,638. FOSSE, J.: Apparatus for the heat treatment of animal material, especially from whale, herring, or other fishes for the production of oil and dry stuff.

590,676. CO-OPERATIVE WHOLESALE SOCIETY, LTD., and HINDLEY, H.: Crates for bottles and the like.

590,729. FRIEDRICH, C. H.: Fish dressing machine.

Abstract of a Recent Specification

Process for Treatment of Cereals

This invention relates to a new or improved process for the treatment of cereals prior to milling, or applied to cereals such as rice, barley, and oats that are partaken as food and are only partly milled.

The object of the invention is to cause the vitamin bodies present in the whole grain, with or without the husk, to be absorbed by the endosperm or starch bodies of the grain together with a proportion of those parts of elementary salts, sugars, and fats, which are water soluble.

A further object is to increase by enzymic action the digestibility and assimilation of the finished product and to produce the latter with superior keeping properties, taste, and appearance.

The invention consists of a method of and means for converting and enriching the endosperm of cereal grain and comprises the steps of placing the grain in a closable vessel, creating a high vacuum therein to pre-empty the voids and capillary spaces of the endosperm of air, of admitting warm water to the vessel for steeping the grain and obtaining a solution of vitamins and like soluble bodies from the grain while maintaining the vacuum during a period to accelerate influx to the voids of the solution of vitamins and like soluble bodies, of applying heat and pressure within the steeping vessel for a further period of time until penetration and osmosis is complete, of separating the steeped grain from the steeping solution, of maintaining the steeped grain for a period of time under conditions to promote enzymic reaction therein, and of then further treating the grain with live steam above atmospheric pressure to gelate or convert the starch, of suddenly releasing the steam with its entrained volatile bodies and their odours and of then drying the grain prior to milling or packeting for sale.

589,344. *Erich Gustav Huzenlaub and Francis Heron Rogers.*

Trade Marks

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

PALM.—640,336. Fish (except live fish); dead poultry; dead game; jams; preserved, dried, canned, and cooked vegetables; preserved, dried, canned, and cooked apricots, peaches, pears, guavas, oranges, mandarins, tangerines, quinces, blackberries, blackcurrants, gooseberries, raspberries, loganberries, bilberries, plums, red currants, cherries, strawberries, grapes, grapefruit, melons, apples, greengages, damsons, bananas, or figs. **Henderson and Liddell, Ltd.**, 15, Eastcheap, London, E.C.3; Merchants.

BLISS BUILT.—645,265. Can-making machinery, mechanical and hydraulic metal working presses, and rolling mills. **E. W. Bliss Co.** (a Corporation organised under the laws of the State of Delaware, U.S.A.), 5302-5324, Second Avenue and Fifty-third Street, Borough of Brooklyn, City and State of New York, U.S.A.; Manufacturers.

SEEMELK.—646,339. Fish meal for use as food for animals. **British Feeding-Meals and Milk Products Co., Ltd.**, Wolsey Works, Carpenters Road, Stratford, London, E.15; Manufacturers.

CASTELLO. — 647,276. Liquorice confectionery (not medicated). **Robinson and Wordsworth (1925), Ltd.**, Victoria Works, Wordsworth's Yard, Beastlair, Pontefract, Yorkshire; Manufacturers.

New Companies

Fisher and Hey, Limited. (436949.) 4 Deal Street, Halifax. To carry on bus. of manufacturers of and dealers in confectionery, chocolate, jam, etc. Nom. cap.: £2,000 in £1 shares. Dirs.: Marion Hey, 2, Brant Avenue, Illingworth, Halifax; J. W. Nethergate, 11, Moorgate Street, King's Cross, Halifax.

Coastal Canneries, Limited. (437791.) 1, Hamilton Road, Lowestoft. To carry on bus. of fish merchants, canners, preservers, etc. Nom. cap. £10,000 in £1 shares. Dirs.: N. Gurwitsch, 8, Queen's Drive, Liverpool; T. Macpherson, Fairstead, Great Warley, Essex; R. W. Train and C. S. Jenks.

W. Brooksbank, Limited. (437920.) 11, Rumford Street, Liverpool. To take over bus. of a biscuit and egg merchant carried on by Wm. Brooksbank at Widnes. Nom. cap.: £3,000 in £1 shares. Dirs.: W. Brooksbank, Ditton Lodge, Liverpool Road, Widnes; Marjorie Moffat, 9, Denton Street, Widnes; J. A. Beggs, 11, Rumford Street, Liverpool.

Louis Spiers (Covent Garden), Limited. (438939.) 21, Russell Street, Covent Garden, W.C.2. To carry on bus. of dealers in potatoes, tomatoes, fresh and dried fruits, etc. Nom. cap.: £2,000 in £1 shares. Dirs.: L. Spiers, 25, Dalkeith Grove, Stanmore; A. Voogel, 185, Swanhurst Lane, Birmingham; H. G. Gale, 25, Caledon Road, East Ham, E.6.

R. A. Rutter, Limited. (438994.) 8, High Street, Croydon. To carry on bus. of ice cream manufacturers, etc. Nom. cap.: £10,000 in 7,000 pref. of £1 and 60,000 ord. of 1s. Dirs.: R. A. Rutter, Tewkesbury, 53, Park Hill Road, Bexley; A. A. Boty, 108, Beddington Gardens, Carshalton.

Richard Brandt and Company, Limited. (439086.) 220/4, Pentonville Road, N.1. To carry on bus. of manufacturers of machines and metal packing cases, etc. Nom. cap.: £5,000 in £1 shares. Dirs.: R. Brandt and Elsa P. J. Brandt, 17, Foscote Road, N.W.4.

Bottle Recovery Company, Limited. (439123.) Nom. cap.: £100 in £1 shares. Permt. dir.: T. W. R. Grant, Millside, Mill Lane, Stock, Essex. Sub.: Mrs. E. M. Grant, Millside, Mill Lane, Stock, Essex.

F. E. Weatherill, Limited. (439151.) 2A, Union Row, N.17. To carry on bus. of manufacturers of and dealers in mechanical, handling, and similar plant, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: F. Weatherill and Georgina Weatherill, 24, Ridge Crest, Enfield.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.